AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

AUGUST 1, 1957

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Autocycling Process for Treatment of Aluminum
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A CHILTON PUBLICATION

How does an oil company

prepare men for industrial technical service work?

Here's how Standard Oil trains its men

At the Standard Oil training center on Chicago's south side—not far from the Company's refinery and research laboratory at Whiting, Indiana—men who have demonstrated an aptitude for such work are given a 17 week course in industrial lubrication, equipment maintenance and metal working. And thus begins the training Standard Oil gives its men who are to provide customers with lubrication technical service.

Most men selected for this Sales Engineering School have college degrees in some engineering or scientific field. And in most cases these men, prior to attending the school, have had field experience in technical service work to start them off with an appreciation of the problems industry meets in lubricating equipment and working with metal.

This course for lubrication specialists and engineers includes lectures and work in chemical laboratory, engine laboratory and machine shop. Senior Standard Oil men, authorities on lubrication and metal working, are the instructors. Other Standard Oilers with teaching skills and extensive field experience, conduct classes, direct the shop work and supervise the school's laboratories.

Class, shop and lab work are augmented by field trips to plants where "students" learn first-hand more about the lubrication problems confronting industrial customers.

The Standard Oil Sales Engineering School has graduated 15 of these classes. The many men who have completed the course are now serving customers out of Standard's 23 offices in fifteen Midwest and Rocky Mountain states. Would you like one of these men to call on you? Then telephone your nearby Standard Oil office. Or write to the Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

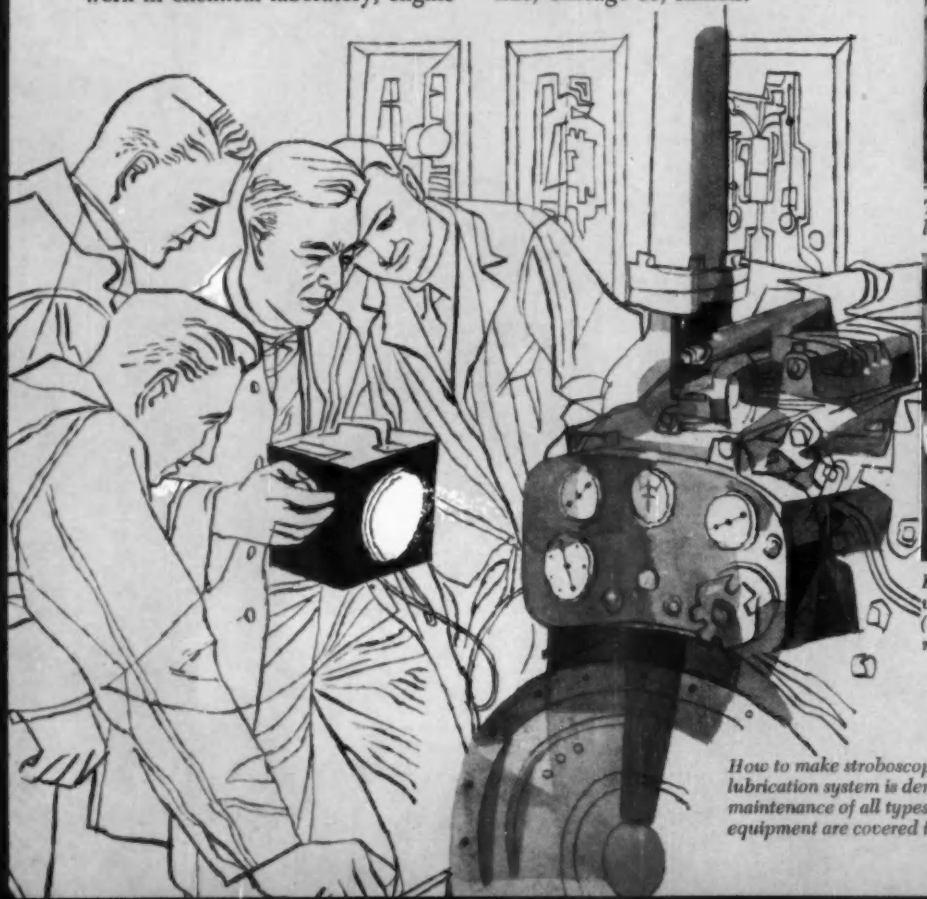
Lectures, shop and lab work comprise training course.

STANDARD

STANDARD OIL COMPANY
(Indiana)

Testing and comparing bearing lubrication methods.

Kinematic viscosimeter is used to test viscosity of lube oil. C. S. Brown (above) learns to run test. Brown, like many classmates, has science degree.



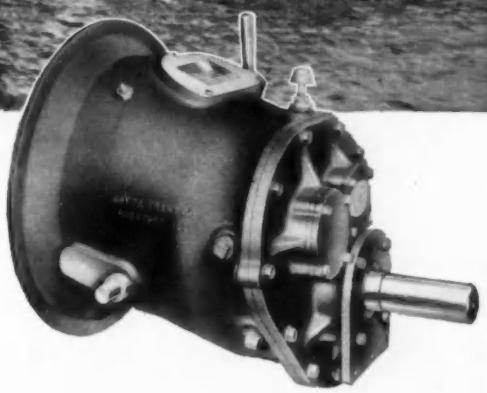
How to make stroboscopic examination of diesel engine lubrication system is demonstrated. Operation and maintenance of all types of industrial and automotive equipment are covered in curriculum.

WORK-BOAT WORKS MORE WITH NEW POWER!

Salmon boat repowered by Hoffars Limited, Vancouver, B. C. . . . with Cotta HA transmission

Installing new diesel engines in British Columbia salmon boats required reduction gear with a reduction ratio of 3.00:1 for front end winch drive application. Cotta Model HA Reduction Unit met this requirement. Work boats of this type demand the dependable performance and long, trouble-free service life that is characteristic of every Cotta unit.

If you have a heavy-duty power transmission problem on any type of equipment, with input torque ranging from 150 to 2000 foot pounds, Cotta standard or "engineered-to-order" transmissions will provide dependable service with outstanding performance at a very low cost.



Broad range of ratios

Input torque from 150 to 1350 foot pounds

For use on cranes, shovels, rock crushers, generators, pumps, etc.

THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions, and complete specifications sent free on request. Just state your problem—COTTA engineers will help you select the right unit for best performance. May we work with you?

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

An Assurance of Dependable Service

COTTA

HEAVY-DUTY REDUCTION UNITS

"Engineered-to-order"

AN IMPORTANT STATEMENT

on selecting steels for heavy-duty transmissions in off-highway equipment:

"Field failures resulting from the use of substitute materials require replacement up to 7 times as often as when nickel alloy steels—proven by experience—are used in the original parts.

"We are unwilling to downgrade gear and shafting steels... the result would be expensive to users in terms of replacement costs."

Fuller Manufacturing Company
Kalamazoo, Michigan

P. S. Fuller speaks from many years of experience building transmissions for the toughest service – in off-highway trucks, earth movers, cranes. Perhaps you too will find that nickel-containing materials are the answer to your metal problem. Check with Inco. All the information and help we can give are yours for the asking. That includes corrosion, high temperature and fabrication help... foundry service... technical publications... convenient sales and field information.

Nickel alloy steel gears and shafts in Fuller's 5-FS-1220 transmission help this Kenworth truck tote a 35-ton load of 48-foot logs up a hill in Vancouver, B.C. Fuller uses types 4820, 4320, 4620 and 2515 steels for carburized parts in this unit.

INCO TRADE MARK THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N. Y.

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

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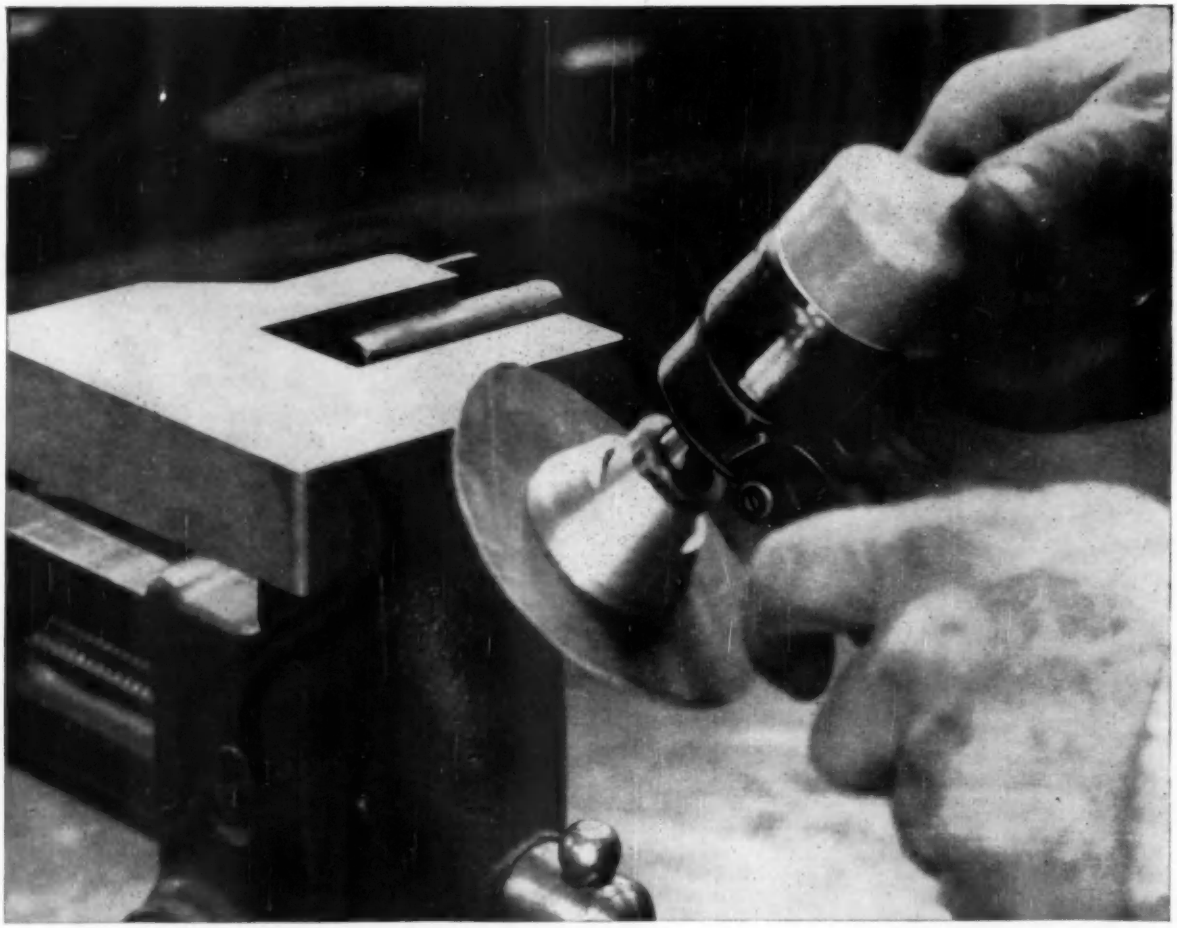


Finishes dies 20% faster... also eliminates abrasive costs

JOB: Putting smooth radius on corners of dies. Formerly used small wheel grinder. Rotor Application Engineer recommended the *right tool*—a Rotor B-02PT 20,000 rpm Disc Sander.

RESULTS: Cut operating time 20%. Light Rotor B-02PT is easier to handle. Gives better finish. Time savings paid for Rotor B-02PT in 12 weeks. Uses 3″ discs, cut down from used 7″ and 9″ discs—a bonus saving of $17.50 per week in abrasive costs.

Why not have a Rotor Application Engineer demonstrate this speedy sander on *your* job. Write for a copy of specifications and Bulletin 53.

Rotor Air Tools: Assembly Tools • Drills • Small Wheel Grinders
Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
Rotor High-Cycle Electric Tools: Grinders • Polishers • Sanders

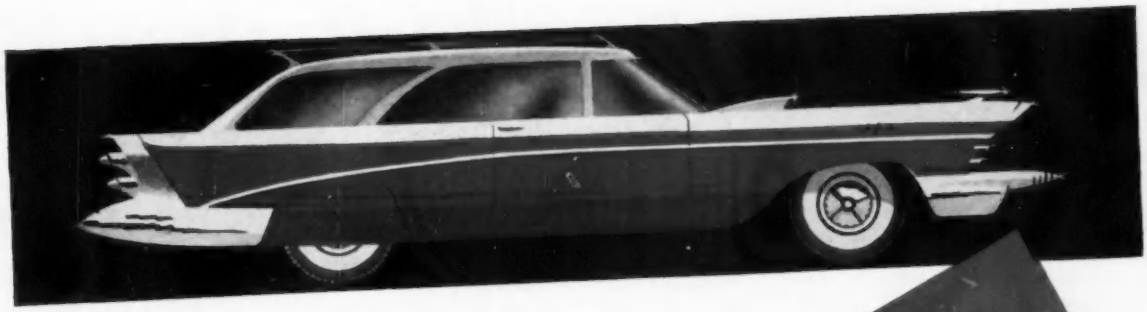
ROTOR TOOLS®
CLEVELAND, OHIO

CLEVELAND

Universal Joints, Propeller Shafts and Power Take-Off Joints

...In Step With The Modern Trend

New, more powerful engines, lower silhouette designs and smaller clearances of today's motor vehicles demand a new type of propeller shaft. It takes a plenty rugged assembly of much higher capacity, capable of working in a much smaller radius, to meet today's exacting requirements.



Having anticipated this trend to super power and super sleekness, "Cleveland" is ready with many new series of propeller shafts. These have greatly *increased* strength and *decreased* swing diameter and also incorporate the many advantages of the celebrated 32 tooth conventional spline shaft pioneered by "Cleveland".

Look to "Cleveland" for propeller shaft and universal joint requirements. We'll welcome the opportunity to work with you.

Since 1912

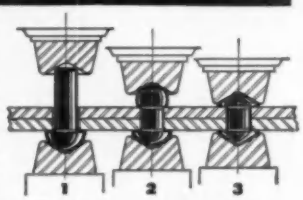
Cleveland Steel Products Corporation

Automotive Division

16025 Brookpark Road
Cleveland 11, Ohio

WHY HANNIFIN "HY-POWER" RIVETERS SAVE YOU MONEY

STRONGER JOINTS!



This "silent squeeze" method gives you (1) rapid advance to riveting position, (2) high-pressure shaping of the rivet, cold or hot, and (3) automatic reversal as soon as the rivet is formed. Why are these rivets stronger? Because with this method the rivet shank expands to completely fill the hole and, as the metal flows to shape the heads, fillets are formed under both heads. The rivet is work-hardened, too, and every rivet is uniform.

FASTER RIVETING!

Yes! From the time the button is touched it takes only 2½ seconds to head a ⅜" rivet. *"Hy-Power" is safe, too!* For the stroke can be interrupted and the ram reversed automatically anywhere in the cycle, simply by releasing the control button.

QUIETER OPERATION!

Here's the power source for this modern riveting method . . . it's the Hannifin "Hy-Power" Generator. This compact unit is a combination of motor, pump, oil reservoir, automatic control valves and high pressure intensifier that quietly supplies hydraulic pressure to...

...your "Hy-Power" cylinders—available in 7½, 10, 12½, 17½, 25, 35, 50, 75 and 100-ton capacities (more in multiple). Cylinders can either be mounted in yokes (portable or stationary) or installed in machines of your design.

GET THE FACTS!

Get Bulletin 150. Learn why cost-conscious firms in many fields use "Hy-Power." Just write for your copy of this 32-page book. We'll mail it promptly.

HANNIFIN

Hannifin Corporation, 543 S. Wolf Rd., Des Plaines, Ill.

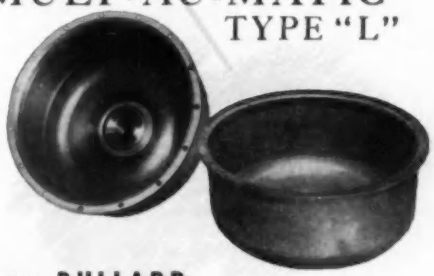
Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

. . . all automatically handled by BULLARD

Transferred to and from the machine by roller conveyors, rough piece is loaded, completely machined and finished part is unloaded without any manual effort. The machining operations performed at seven stations include boring and counterboring, rough and finished facing, rough and finished turning, drilling and chamfering — eighteen separate operations in all.

"We went to Bullard on this job" according to the Master Mechanic of a leading manufacturer of automotive clutches, "because our program definitely called for a multiple spindle machine and the Bullard Mult-Au-Matic, Type "L" was best suited for the operation. Actually, its greater number of stations, larger spindles and greater power made it the only multiple spindle machine which fitted the job."

MULT-AU-MATIC
TYPE "L"



Remember . . . to cut cost when cutting metal — buy **BULLARD**

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INFORMATION CALL YOUR
NEAREST SALES ENGINEER
OR SEND FOR CATALOG TODAY.

THE BULLARD COMPANY
286 CANFIELD AVENUE • BRIDGEPORT 9, CONN.
Please send me a copy of the NEW MULT-AU-MATIC, TYPE "L" CATALOG

Name_____
Company_____ Position_____
Address_____
City_____ Zone_____ State_____

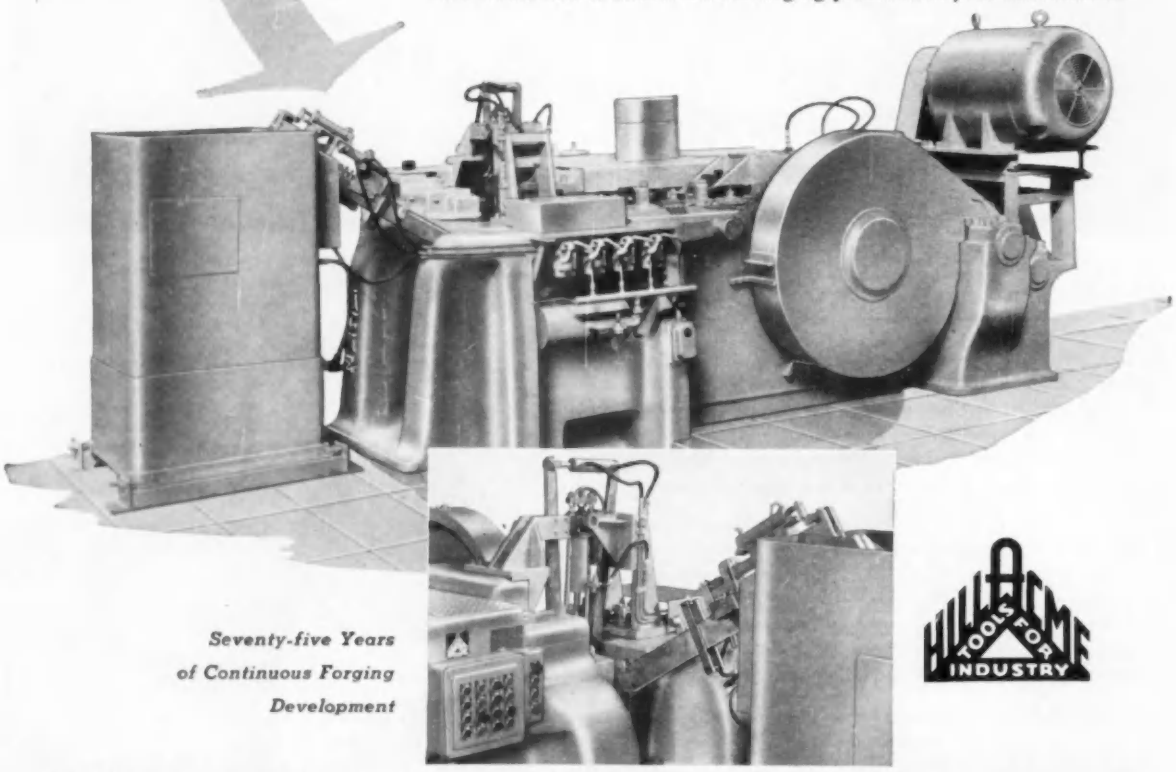
ACME MODEL XN

produces 2,400 completed forgings per hour!

A standard 3" ACME XN forging machine is producing, in multiple operations, a completed forging with every stroke of the machine in the plant of a large automotive manufacturer. Continuous operation with an automatic feeding device makes this amazing production possible.

PHENOMINAL SAVINGS

The increase in output through continuous operation of this ACME XN forging machine results in savings which are not only impressive but approach the incredible. The ACME XN with automatic feed is adaptable to either single or multiple operation forging. Every job, of necessity, calls for special design in the feed mechanism depending upon the shape, size and weight of the material involved. ACME XN forging machines are made in capacities from 1" to 5". We would like to discuss YOUR forging problems at your convenience.



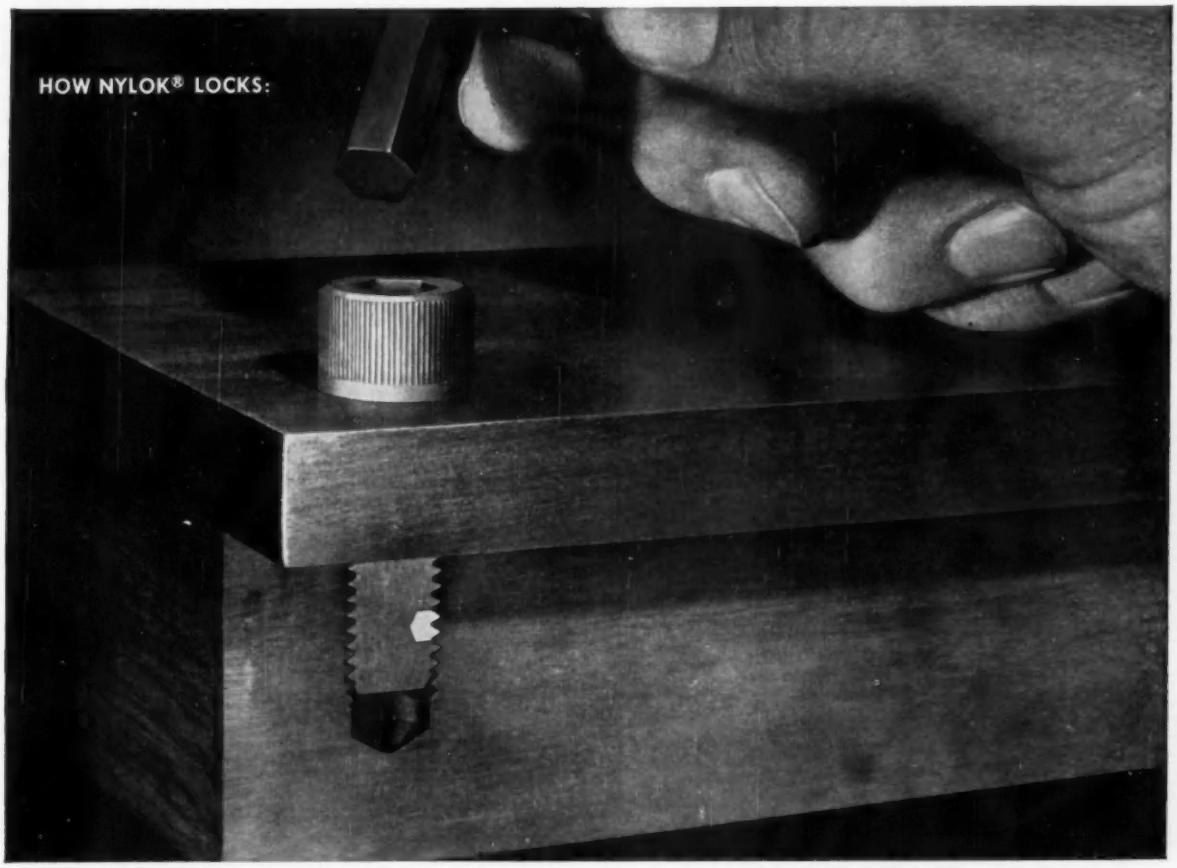
Seventy-five Years of Continuous Forging Development

HILL ACME TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

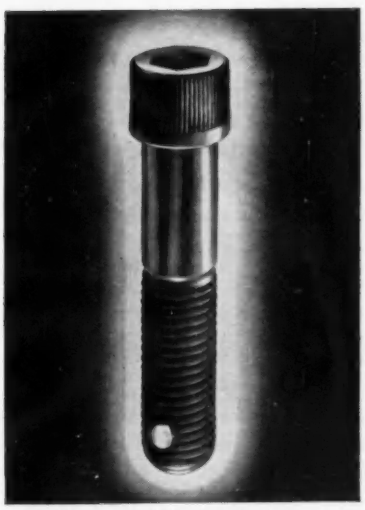
ACME MACHINERY DIVISION • **1209 W. 65th St., Cleveland 2, Ohio**
ESTABLISHED 1882

"ACME" FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" GRINDING & POLISHING MACHINES
HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES



LOCKED! The tough, resilient nylon pellet keys itself into the mating threads. It forces threads together and locks the screw securely.

NEW—self-locking UNBRAKO socket head cap screws



Self-locking UNBRAKO socket head cap screw.

They won't work loose. And they simplify design and save production time.

UNBRAKO socket head cap screws are now available embodying the Nylok* self-locking principle. Nylok provides the first truly practical solution to the problem of making cap screws self-locking.

An UNBRAKO cap screw with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Just thread the UNBRAKO into any tapped hole. *Seated or not*, it locks positively wherever wrenching stops. The tough, resilient nylon pellet forces mating threads together and holds tight. The screw will not work loose.

You save production time when you make products with self-locking UNBRAKOS. And you get greater simplicity in design with less bulk and weight. The number of parts you must assemble to achieve full locking action is reduced to the absolute minimum. Lockwashers under screw heads are no longer necessary. Costly wiring of cross drilled heads is eliminated. And in many cases you will save weight and mass by using shorter screws in tapped holes instead of drilling through and using nuts and lockwashers.

Self-locking UNBRAKOS are reusable. They have uniform locking and installation torques—with no galling or seizing on mating threads. They successfully withstand temperatures from —70° to 250°F. And, when screws are properly seated, the locking pellet also functions as a liquid seal.

A complete line of self-locking UNBRAKO socket screw products, in a wide range of standard sizes, materials and finishes, is available through your authorized industrial distributor. Technical data and specifications are detailed in Bulletin 2193. Write us for your copy today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 53, Pa.

T.M. Reg. U.S. Pat. Off., The Nylok Corporation

STANDARD PRESSED STEEL CO.

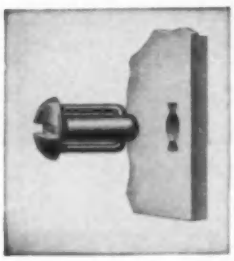
UNBRAKO SOCKET SCREW DIVISION

SPS

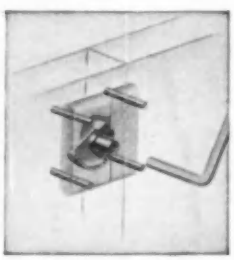
JENKINTOWN PENNSYLVANIA

3 ways to save on assembly costs

QUICK-LOCK For fastening removable access doors and panels. Because of its ease of installation, QUICK-LOCK is ideal for assembling removable panels. A 90° turn locks it in place. Stud is self-ejecting when unlocked; visual inspection shows whether fastener is locked. Spring loading takes initial load; solid supports carry increased load. Available in a wide range of sizes.



SPRING-LOCK One-piece fastener for blind holes has load-carrying steel spring wire. Spring steel arms lock fastener securely, prevent loosening under vibration. SPRING-LOCK will work with varying panel thicknesses, locks with a twist of the wrist. Made in all-metal and plastic with steel insert. The molded design permits heads to be made in various shapes for refrigerator shelf supports, washer knobs, brackets. Available in a wide variety of shapes and sizes, and also in custom designs.



ROTO-LOCK Serrated, tapered cam is engaged by formed lug as fastener is locked. Cam action draws panels together tightly, insures locking even under conditions of misalignment. Opens easily for demounting. ROTO-LOCK carries heavy tension and shear loads; can be used for air and water-tight seals; recesses completely into panels. Solidly built without springs or delicate mechanical parts, unaffected by arctic temperatures or field service.

Simmons

QUICK-LOCK
SPRING-LOCK
ROTO-LOCK
LINK-LOCK
DUAL-LOCK

JUST OUT!
NEW 36-PAGE CATALOG WITH APPLICATIONS
SEND FOR IT!

Simmons Fasteners are widely used in refrigerators, washing machines, electrical equipment, electronic assemblies, prefabricated portable shelters, coolers, demountable furniture. Every Simmons Fastener is a service-proved design with a long record of assembly-cost saving in many industries.

If you are interested in cutting your costs, turn to Simmons Fasteners—the fasteners with *uses unlimited*. Write for samples and catalogs today.

SIMMONS FASTENER CORPORATION
1749 NORTH BROADWAY, ALBANY 1, NEW YORK

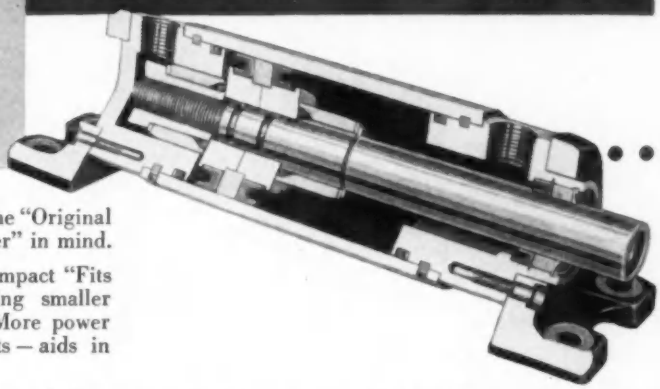
O-M Built-in QUALITY

Means Built-in ECONOMY

O-M Tie-Rodless Cylinders 150 PSI Air– Up to 1500 PSI Oil

Meet JIC Standards

Fit Where Others Won't!



O-M cylinders were designed with both the "Original Equipment Manufacturer" and the "User" in mind.

Space-Saving — O-M is the original compact "Fits where others won't" cylinder, allowing smaller castings to be used in machines, or "More power for same space"— easily oriented ports — aids in design problems.

Best of Materials — Precision honed steel barrels, bronze bearing surfaces, machined steel end covers, highly polished chromed piston rods, rod scrapers, proper packings for the various operating mediums and pressures — just to mention a few.

Long Life — Quality material, accurate machining, fine finished, proper bearing materials, precision assembly, individual testing are assurance of long life.

Easy Maintenance — The internal key feature not only makes it possible to save space and to easily orient ports, but also makes it easy to disassemble, inspect, clean, repair and reassemble—thus further reducing costly down-time.

Original Cost — Priced right! Compare prices and quality to be convinced.

O-M Air and Hydraulic Tie-rodless Cylinders are available in a complete range of sizes (1½" to 8" bores) with standard or heavy duty rods. Completely interchangeable parts and mounts. Immediate delivery on many sizes.

Mail coupon at once for Bulletins 101A (O-M Tie-Rodless Air and Hydraulic Cylinders) and 105 (O-M Series T-H — Heavy duty Hydraulic Cylinders)

Engineering Service

Consult an Ortman-Miller representative regarding your pneumatic and hydraulic problems. His broad experience with standard and special cylinder applications is available to you without cost or obligation. Use convenient coupon for name and address of O-M representative nearest you.

ORTMAN-MILLER MACHINE COMPANY

17 143rd Street, Hammond, Indiana

☐ Have representative call

☐ Send Bulletins 101A and 105

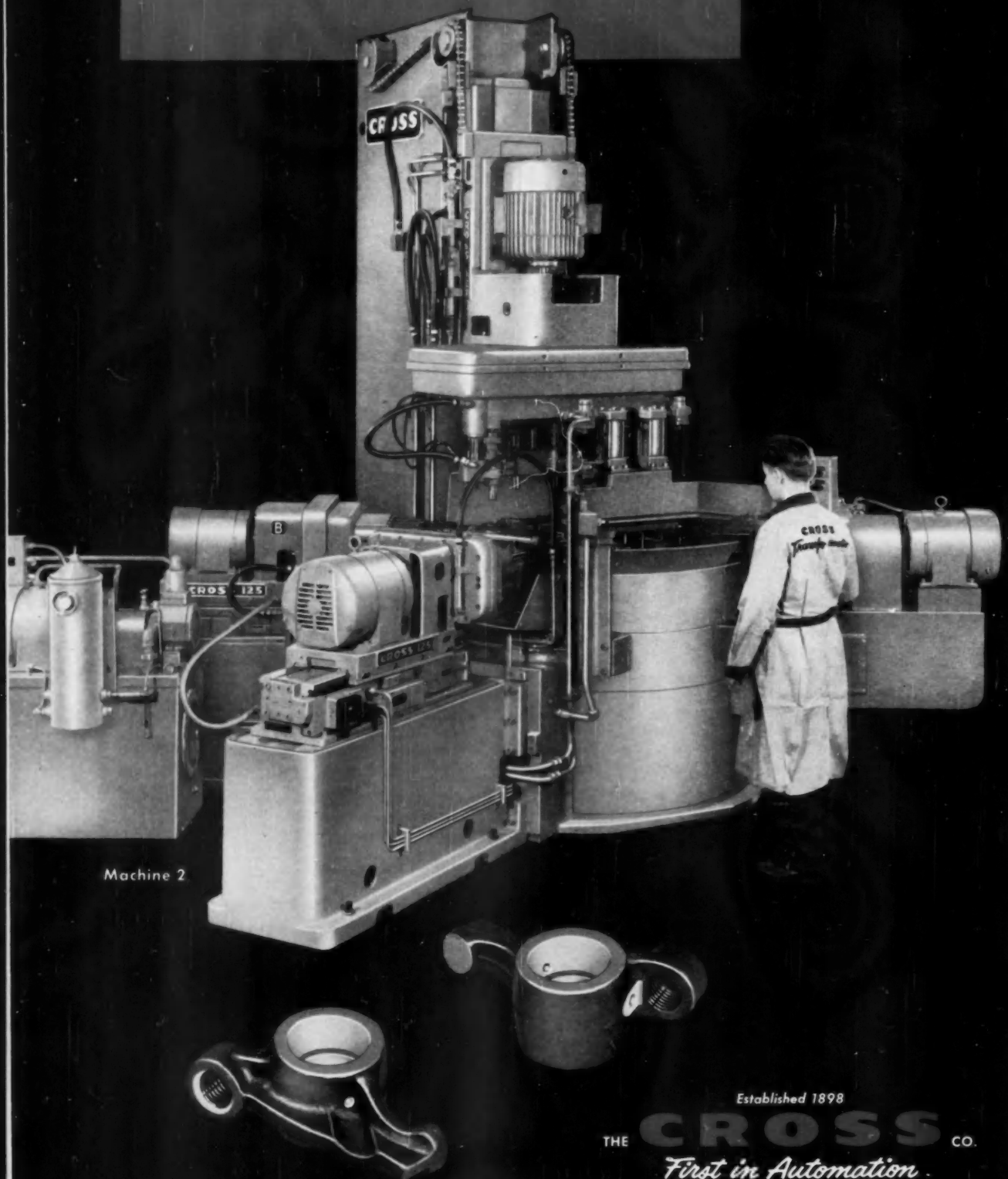
Name_____ Position_____

Company_____

Address_____

City_____ Zone____ State_____

Two Dial Type Machines Process Valve Rocker Arms



Machine 2

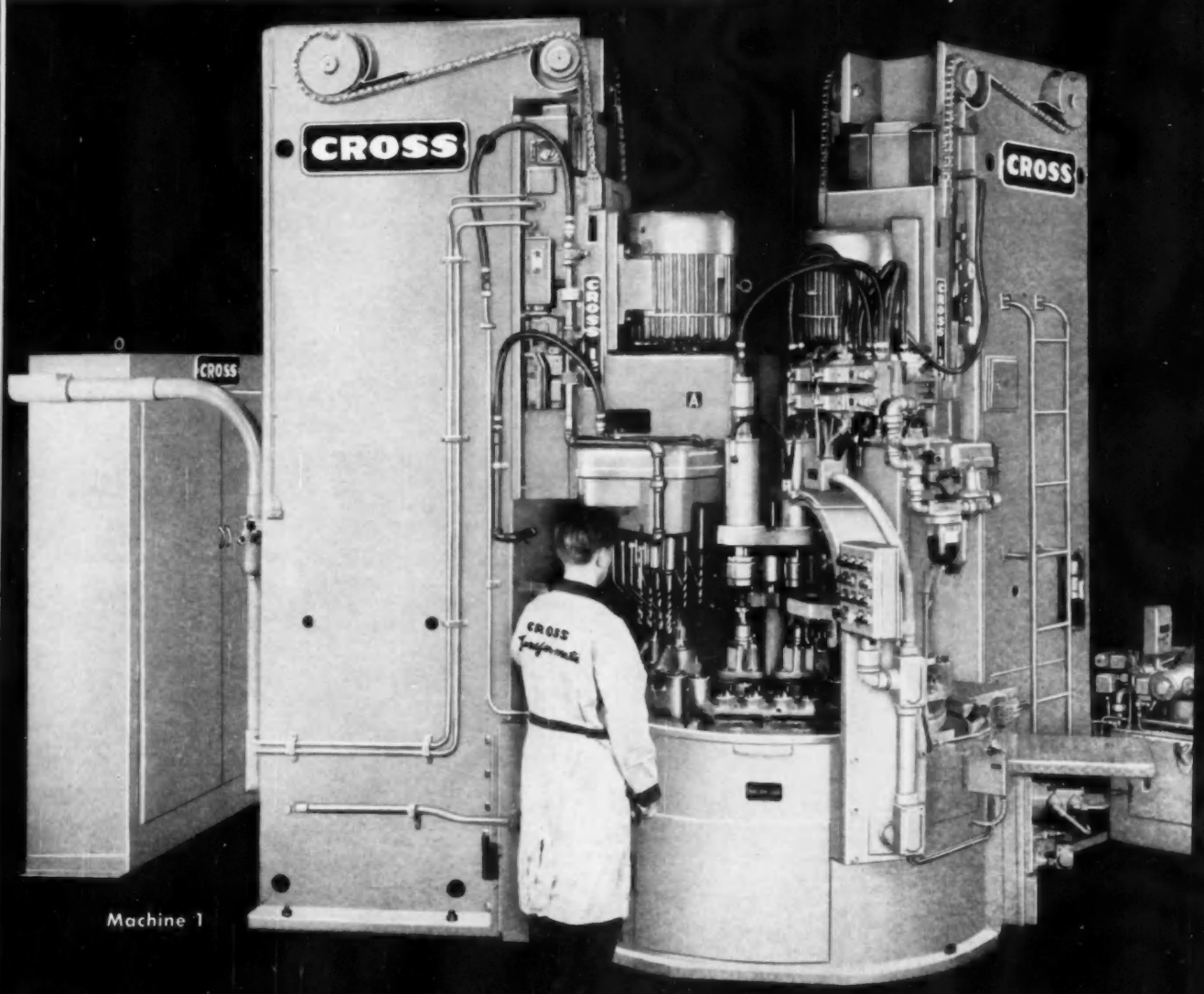
Established 1898

THE CROSS CO.

First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN

More Specials by Cross



Machine 1

- ★ 800 pieces per hour at 100% efficiency.
- ★ Four parts machined in each station.
- ★ Machine 1 drills and reams rocker shaft hole; forms oil groove; drills one oil hole. Machine 2 drills, chamfers and taps adjusting screw hole; drills, counterdrills and spotfaces second oil hole.
- ★ Push button controlled power wrenches operate fixture clamps.
- ★ Cross "building block" construction provides flexibility for part design changes.
- ★ Complete interchangeability of all standard and special parts for easy maintenance.
- ★ Other features: Construction to JIC standards; hardened and ground ways; hydraulic feed and rapid traverse for drilling and reaming; individual lead screw feed for tapping; automatic lubrication; pre-set tooling throughout.

How to bring a high-flying

New Goodyear cushioning medium makes the impossible practical—provides new R-O-O-M for comfort!

NEVER SAY "IT CAN'T BE DONE"—unless you mean it can't be done by the old, conventional methods.

For when you employ AIRFOAM as a *designing aid* and *basic component* (rather than just as an alternate cushioning) you open new vistas of space engineering.

You see, full-depth AIRFOAM, molded to your specifications, eliminates need for bulky elements—fits *more* good style and *more* luxurious comfort into *less* interior cubage.

Once you turn your back on the old no-can-do—and share your seating problems with Airfoam Development Engineers—you'll find your highest-flying ideas come down to earth without losing a single feather!

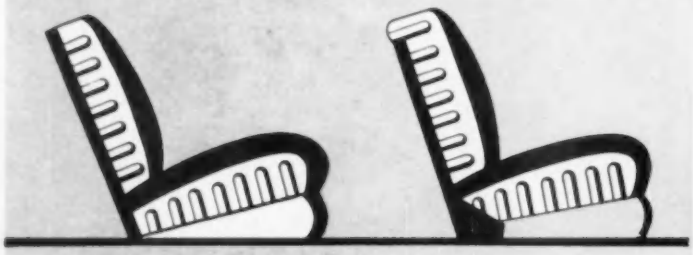
We've got a lot of answers here at Development. Maybe some fit your favorite questions. Just contact Goodyear, Engineered Products Dept., Akron 16, Ohio.

Isn't it difficult and costly to keep this piping uniform?

NO. It's molded-to-shape AIRFOAM—can be quickly duplicated everytime.

CROSS SECTION COMPARES OLD AND NEW SEAT CONSTRUCTION:

Solid areas show space saved by full-volume AIRFOAM *seat-units.*



(Even though AIRFOAM *seat is one inch lower—eye level remains the same)*

Don't individual seat bases cost plenty?

Not when this simple. The AIRFOAM just makes them look intricate.

Airfoam

MADE ONLY BY GOODYEAR

THE WORLD'S FINEST, MOST MODERN CUSHIONING

Airfoam—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

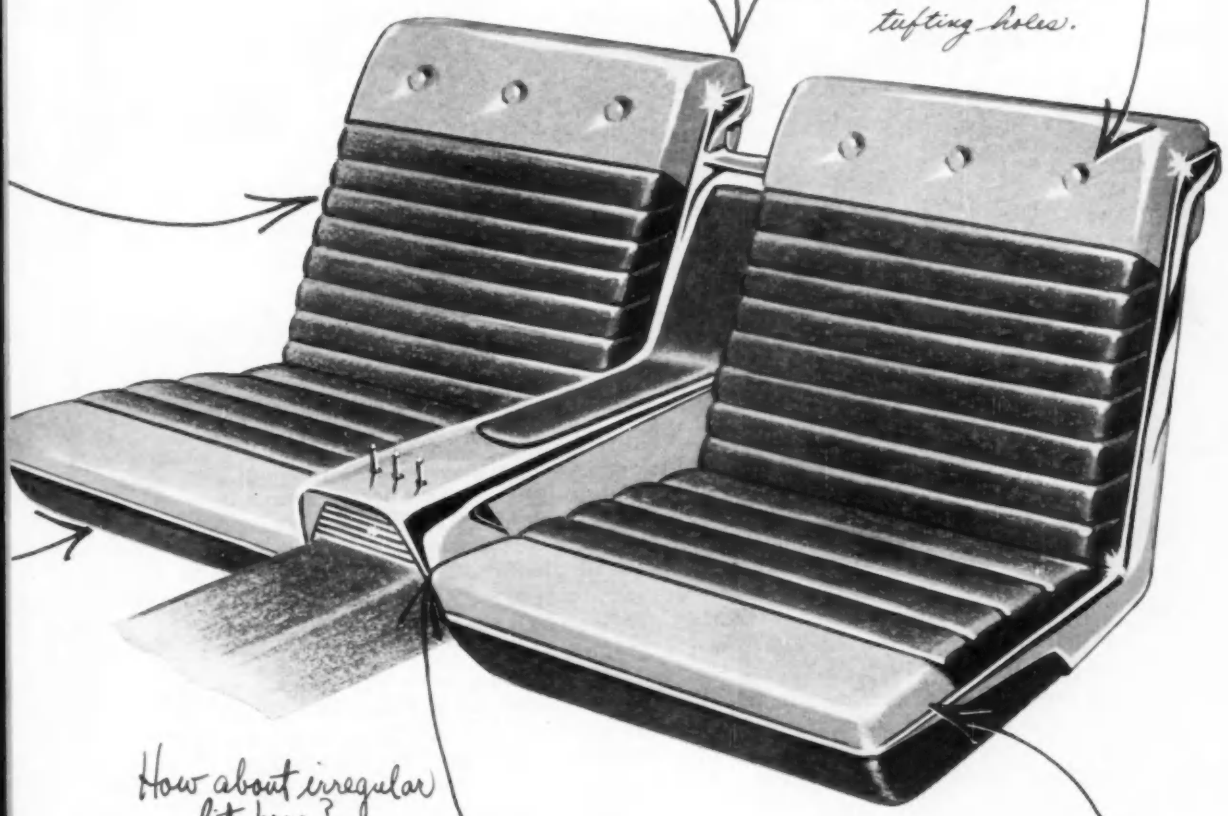
seat idea down to earth

How about these hard corners?

There aren't any. Molded AIRFOAM needs no edge-braces or corner-braces.

Doesn't this tufting cause hard spots?

NO. It's all molded AIRFOAM, relieved at tufting holes.

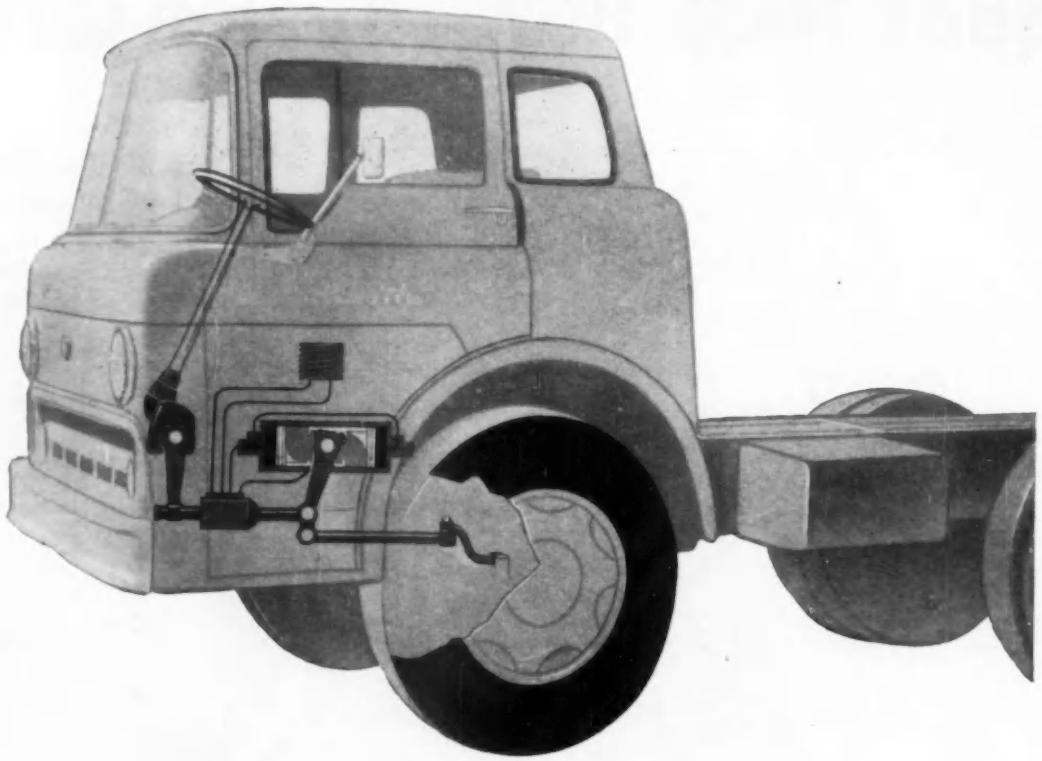


How about irregular fit, here?

NO problem. Full-volume AIRFOAM tailors this point perfectly.

How can you build comfort into such a low seat?

Let full-depth AIRFOAM do <u>all</u> the cushioning work. Remember—it's an entirely new cushioning <u>medium</u>!



New Thompson power steering cylinder helps Ford solve design problem

WHEN Ford Truck Division needed a new type power steering cylinder for their 1957 tilt cab model truck, they turned to Thompson Products, Michigan Division, for the one best answer.

Thompson engineers came up with a cylinder application that more than met the need. It was actually 9 ways better than any previous power steering cylinder.

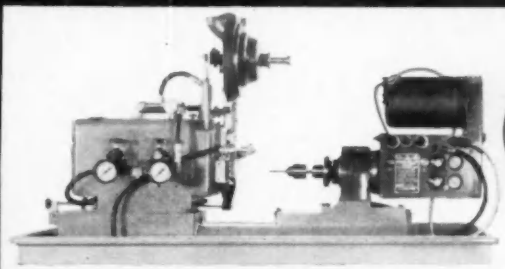
New in design, the self-lubricating cylinder has two pistons acting together on one output shaft. Result is a well balanced bearing load . . . even torque output in either direction at any pressure . . . and excellent torque output for cylinder size and weight. In addition, the unit lends itself readily to the design trend of moving engine and cab forward to secure greater payload.

Thompson engineers will be glad to help you solve your problems. Write, phone or wire Michigan Division, Thompson Products, Inc., 34201 Van Dyke, Warren, Michigan.

You can count on **Thompson Products**

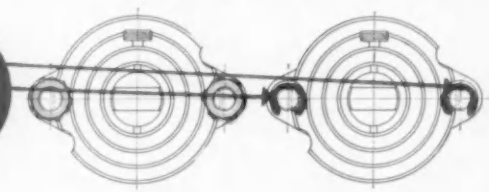
Michigan Division:
Warren and Portland

Waldes Truarc Retaining Rings Eliminate Machining and Parts—Cut Assembly Time on Drill and Tapper



Beco Model 410 Drill and Tapper

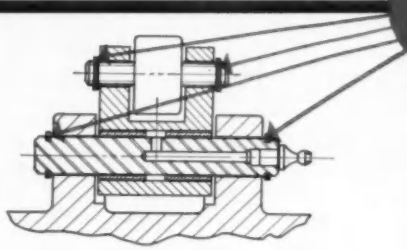
The Batchelder Engineering Co., Inc., Springfield, Vermont uses 4 different sizes of 2 different type Waldes Truarc rings in their new BECO Model 410 Automatic Drill and Tapper. Truarc rings speed assembly, reduce machining, improve design.



ALTERNATE DESIGN TRUARC DESIGN

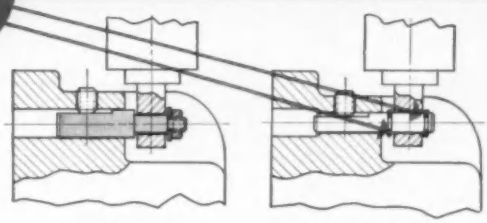
Clamp Cylinder Rod Stop Assembly

Truarc "E" Rings (Series 5133) replace stop nuts in the Clamp Cylinder assembly. They eliminate need for threading 2 rods ...the danger of cross-threading nuts...and costly rejects. Truarc Rings cut assembly time and cost.



Bell Crank Pivot Assembly

Truarc Rings (Series 5100) in Bell Crank Pivot assembly permit grease hole not possible with cotter pin fastener. Use of nuts would have increased machining and assembly costs considerably.



ALTERNATE DESIGN TRUARC DESIGN

Hopper Cylinder Anchor Pin Assembly

2 Truarc Rings (Series 5100) secure and position end of vertical air cylinder. Rings eliminate extra cost of machining 3-diameter pin, threading and undercutting...plus nut and washer. Assembly is quick and sure.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product... to save you material, machining and labor costs. They're quick and easy to assemble and disassemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality controlled from raw material to finished ring.

36 functionally different types... as many as 97 different sizes within a type... 5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U. S. A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today... let our Truarc engineers help you solve design, assembly and production problems... without obligation.

For precision internal grooving and undercutting... Waldes Truarc Grooving Tool!

WALDES

TRUARC®

RETAINING RINGS

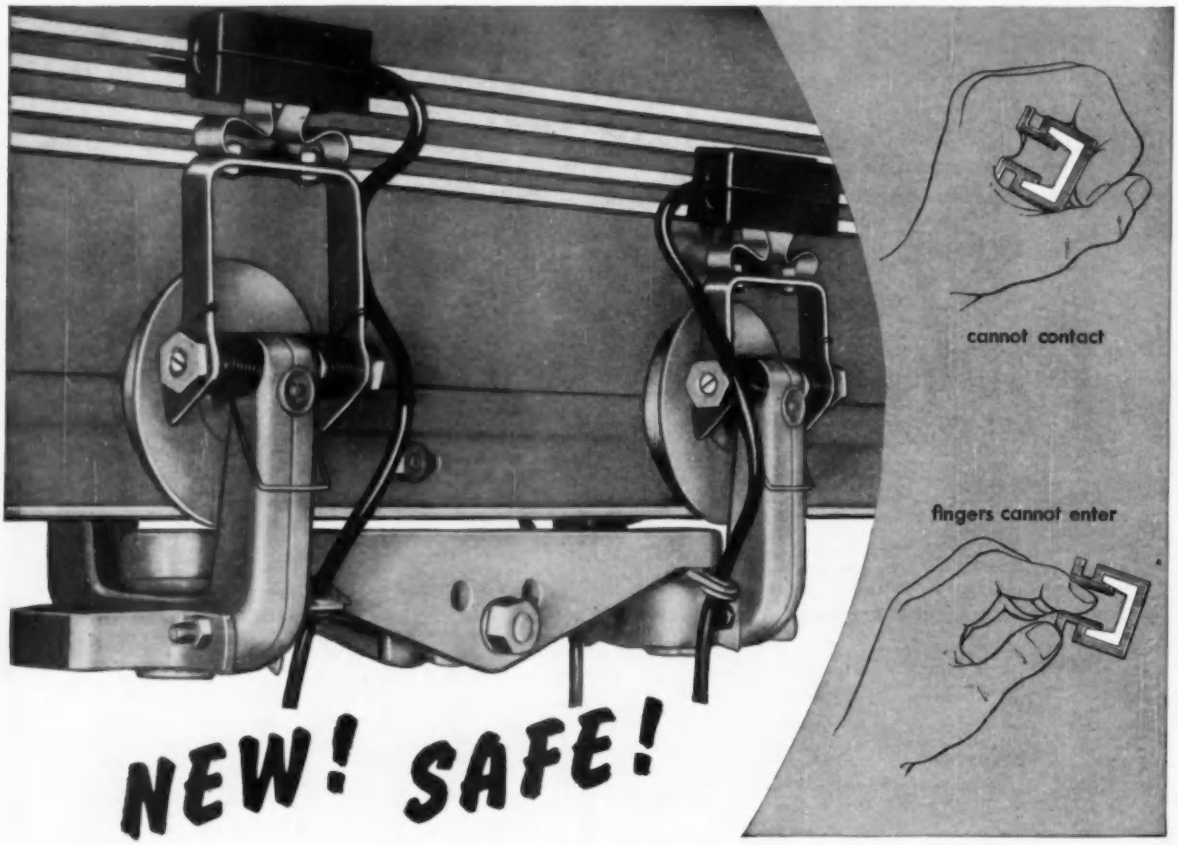
WALDES KOHINOOR, INC.
47-16 AUSTEL PLACE, L. I. C. 1, N. Y.

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N.Y.
Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
(Please print)

Name .....
Title .....
Company .....
Business Address .....
City ..... *Zone* ..... *State* .....

AY087

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.



NEW! SAFE!

AMERICAN MONORAIL

KANT SHOCK

SHIELDED ELECTRIFICATION

For Monorail Track and Crane Systems

By covering its standard bus bar electrification with a specially designed polyvinyl chloride extrusion, American MonoRail now furnishes completely safe electrified systems.

This KANT-SHOCK shielding absolutely prevents accidental contact with live bus bars. It is impossible for an adult's finger to enter the shield.

A new type sliding shoe collector provides a floating contact throughout a monorail system regardless of any misalignment due to bent bars or at switch and inter-lock connections.

KANT-SHOCK Electrification positively eliminates all the hazards of open bar conductors—prevents costly accidents—protects employees—reduces insurance rates.

Write for KANT-SHOCK Bulletin KS-1

Member of Materials Handling Institute and Monorail Manufacturers Association

For Power Driven Conveyors, Use Landahl Chainless Conveyors

AMERICAN MONORAIL COMPANY

OVERHEAD HANDLING EQUIPMENT

13147 ATHENS AVENUE, CLEVELAND 7, OHIO (IN CANADA—CANADIAN MONORAIL CO., LTD., GALT, ONT.)

How Great Lakes Steel *inspects scrap* quality

Two things don't belong in this gondola—and a team of trained Great Lakes Steel scrap inspectors is searching them out. The intruders are *non-ferrous material* and *high sulphur content ferrous material*, which contaminate heats and spoil the quality of finished steel.

Additional visual inspection in the stockhouse and on the open-hearth floor, magnetic screening, and weight checks all combine to detect and eliminate these adulterants, before the scrap is fit to become a part of Great Lakes steel.

Sound like a lot of trouble? It's worth it, to us and to our customers. And it's just one more step in Great Lakes Steel's continuing program of quality control that assures you the finest steels. Make it a point to contact your Great Lakes Steel representative for the rest of the story. He's as close as your telephone.

Here approved scrap, in charging boxes on buggies, heads for the open hearths. Quality scrap gives finished steel improved surface and ductility characteristics.

GREAT LAKES STEEL CORPORATION

Detroit 29, Michigan • Division of

NATIONAL STEEL CORPORATION

District Sales Offices: Boston, Chicago, Cincinnati, Cleveland, Grand Rapids, Houston, Indianapolis, Lansing, Los Angeles, New York City, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Toledo, Toronto.

NEW

When strategic aircraft requirements indicated a NEW type of universal joint, MECHANICS engineers developed it. Design, metals, machining, tolerances, heat-treating, hardening, stamina, balance and lubrication — all were adapted to specific aircraft precision. Let MECHANICS engineers design and build universal joints that are equally well suited to the exact power transmission needs of *your* product. The competitive advantages that designed-for-the-job MECHANICS Roller Bearing UNIVERSAL JOINTS provide, are well worth investigating—while your new models still are on the drawing board.

MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner 2024 Harrison Ave., Rockford, Ill.

MECHANICS
Roller Bearing BW
UNIVERSAL JOINTS

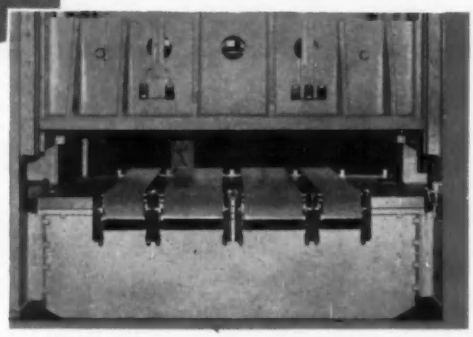
For Cars • Trucks • Tractors • Farm Implements • Road Machinery •
Aircraft • Tanks • Busses and Industrial Equipment

The operating ease and convenience that mean *Better Production at Lower Cost!*

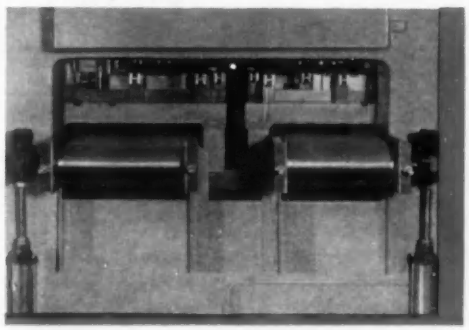
PUNCHING AND NOTCHING MACHINES

CAPACITIES: 200-300 Tons
SIZES: 36" to 60" front to back
LENGTHS: 96" to 140"

Struthers Wells Punching and Notching Machines have the features you need for productivity and profit! Massive, self-sustaining construction for low deflection and long die life. Off-center loading, permitted by wide gibbing. Left to right or front to back feeds. Good operating clearance for easy die mounting. Positive scrap cutoff *up to 20 ft* with SW die design. • Check these *Struthers Wells* advantages—let us bring you the facts, without obligation.



Efficient scrap removal is vital to economical production—side or end conveyors are available as specified.



STRUTHERS WELLS CORPORATION

Machinery Division: **TITUSVILLE, PENNSYLVANIA** · *Offices in Principal Cities*

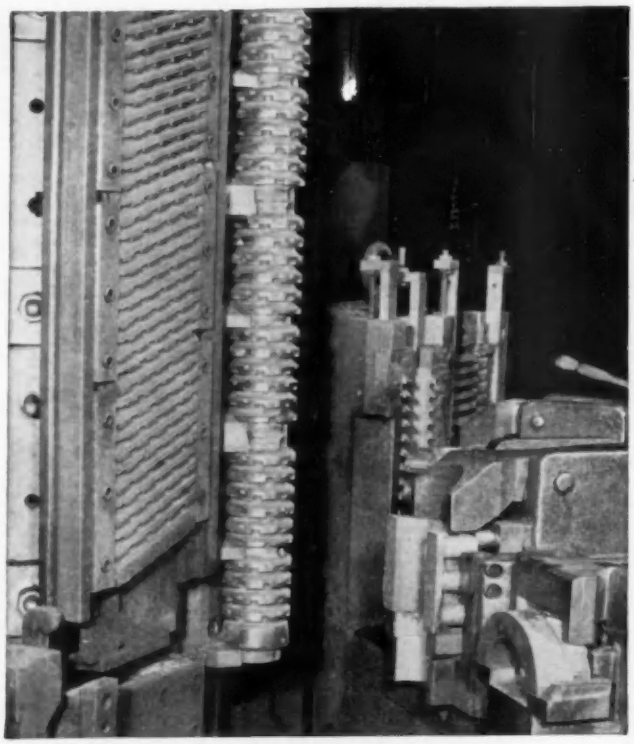
STRUTHERS WELLS PRODUCTS:

BOILER DIVISION
BOILERS for Power and Heat . . . High and Low Pressure . . . Water Tube . . . Fire Tube . . . Package Units

FORGE DIVISION
Crankshafts . . . Hydraulic Cylinders . . . Pressure Vessels . . . Shafting . . . Straightening and Back-up Rolls

PROCESSING EQUIPMENT DIVISION
Crystallizers . . . Direct Fired Heaters . . . Evaporators . . . Heat Exchangers . . . Mixing and Blending Units . . . Quick Opening Doors . . . Special Carbon and Alloy Processing Vessels . . . Synthesis Converters

MACHINERY DIVISION
MACHINERY for Sheet and Structural Metal Forming . . . Tangent Benders . . . Folding Machines . . . Roller Table and Tumble Die Bending Machines . . . Press Brakes . . . Punching and Notching Machines . . . Forming Dies



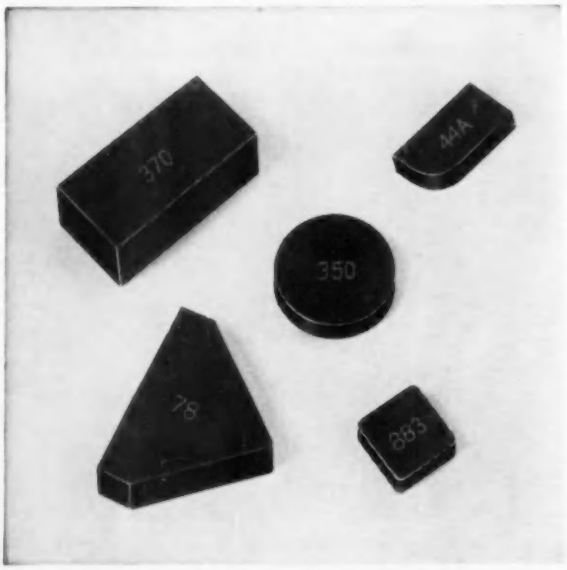
Grade 883 increases broach life 2500%

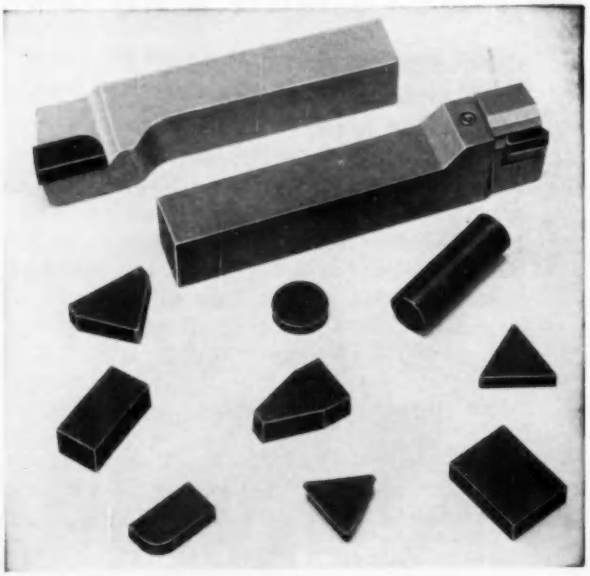
Highly abrasive cast iron used for this bearing cap at Studebaker caused conventional broaches to fail after maximum run of only 3,600 parts. After the switch to Grade 883, initial broach ran 50 days, produced 90,000 parts without service. Over-all machining costs were reduced 22%.

Grade 370 saves 155 hours' machining time

Normal machining time on this 165-ton cast-steel propeller runner at S. Morgan Smith Co. was 220 hours. Despite abrasive patches, and interrupted cuts, Grade 370 cut machining time to 65 hours – ⅓ the time. At 154 fpm, Grade 370 ran 30 hours without changing – compared to 6-8 hours with previous tools.

WHY MACHINE OUTPUT GOES UP, WITH CARBOLOY® CARBIDES ON



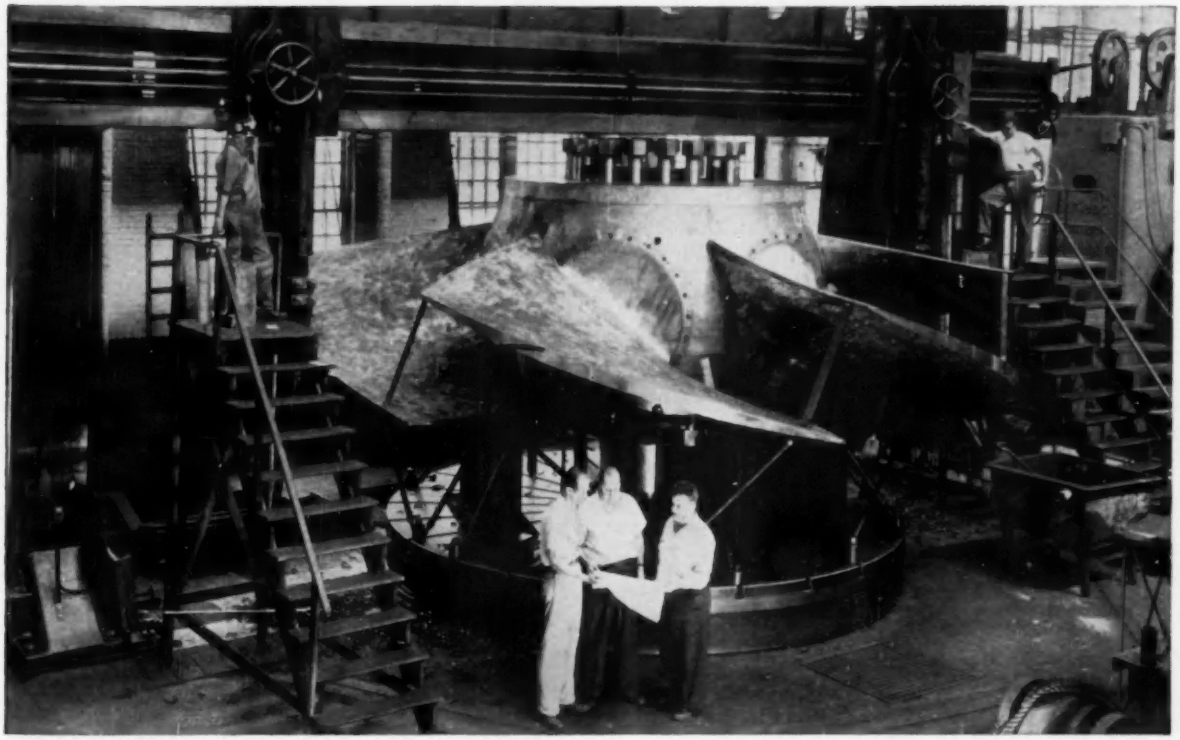


Grades for cutting every material

Eleven grades to choose from: 300 Series and 78 Series carbides for cutting steel; new Grade 860 for cast iron; five grades for nonferrous machining.

. . . in a form for handling every job

Standard tools in thirteen styles, hundreds of sizes; standard blanks in wide range of styles and sizes. Inserts for Carboloy toolholders or other standard types.



AND UNIT COST COMES DOWN, YOUR METALCUTTING JOBS

- Carboloy cemented carbides are tailored to the job
- Let you cut faster without sacrificing tool life

You'll increase the productivity of your machines, while you reduce total manufacturing cost per piece, when Carboloy cemented carbides go to work on your jobs.

Your machines will be more productive, because they can operate at greater speeds and feeds when tooled with the Carboloy grade designed for the job. And they'll produce more per shift, because Carboloy carbides take rugged machining conditions without sacrifice of tool life.

Your units costs will go down, because the use of these grades means less machining time per piece . . . with lower downtime expense, reduced grinding and maintenance charges.

Proved in the field

Hundreds of inplant case histories like the two shown above prove Carboloy cemented carbides can double and triple output, save thousands of dollars per year in machine time, manpower, and tool costs.

The reason is simple. Each Carboloy carbide grade has cutting characteristics tailored to a particular type of job. Whether you're machining ferrous or nonferrous metals, whether you're taking heavy or finishing cuts . . . one of the eleven Carboloy carbide grades handles the job. And you can quickly get the *grade* you need, in the *form* you need it.

Stocked locally by Carboloy Distributors

Your local Authorized Distributor of Carboloy cemented carbide products stocks standard tools, blanks, inserts, and toolholders in styles and sizes for every job or machine. He'll give you fast delivery, and expert technical assistance.

Call him today (you'll find his name in the Yellow Pages of your phone book). Or write: *Metallurgical Products Department of General Electric Company, 11151 E. 8 Mile Street, Detroit 32, Michigan.*

CARBOLOY®
CEMENTED CARBIDES

GENERAL ELECTRIC

FORD BUILDS FOR THE FUTURE WITH

CYPAK

... controlling form grinder sequencing in automatic transmission production

CYPAK* static controls have already outlasted conventional relays previously used at the Ford plant in Livonia, Michigan. No down time for control maintenance has been necessary with this highly repetitive operation in over 17 months!

Logic and sequencing control of two Springfield Machine Tool Co. form grinders is performed by CYPAK static control apparatus. CYPAK activates the solenoids of hydraulic valves controlling the grinder's feed cycle.

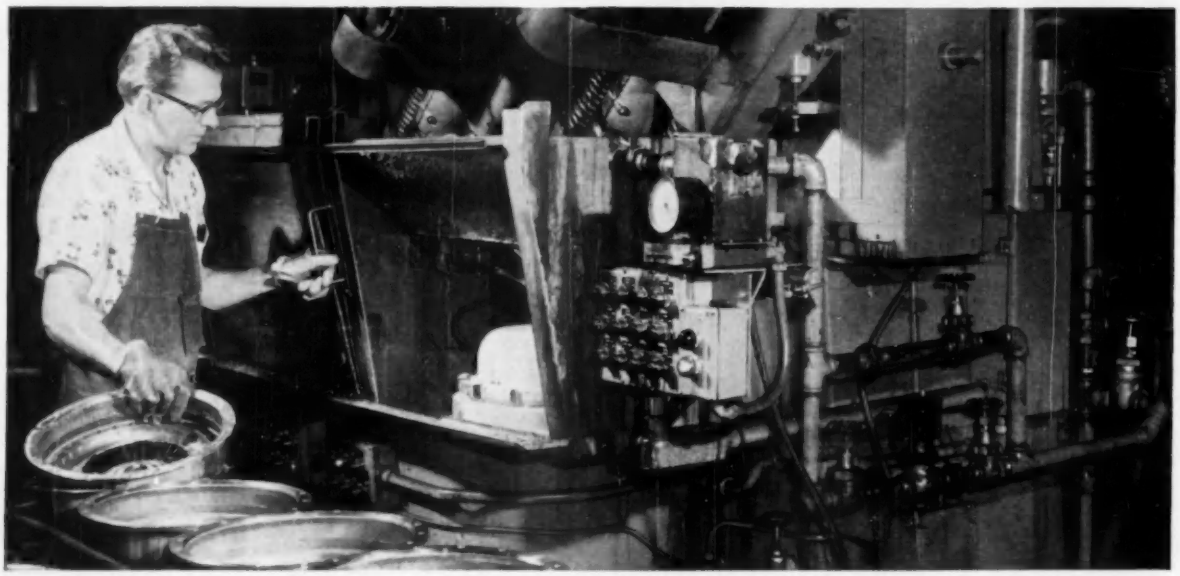
In machining the impeller housing of automatic transmissions, the operator places the workpiece in the chuck, presses the cycle button ... and CYPAK does the rest ... automatically.

For complete information about CYPAK call your Westinghouse representative, or write Westinghouse Electric Corp., Dept. B, P.O. Box 868, Pittsburgh 30, Pa.

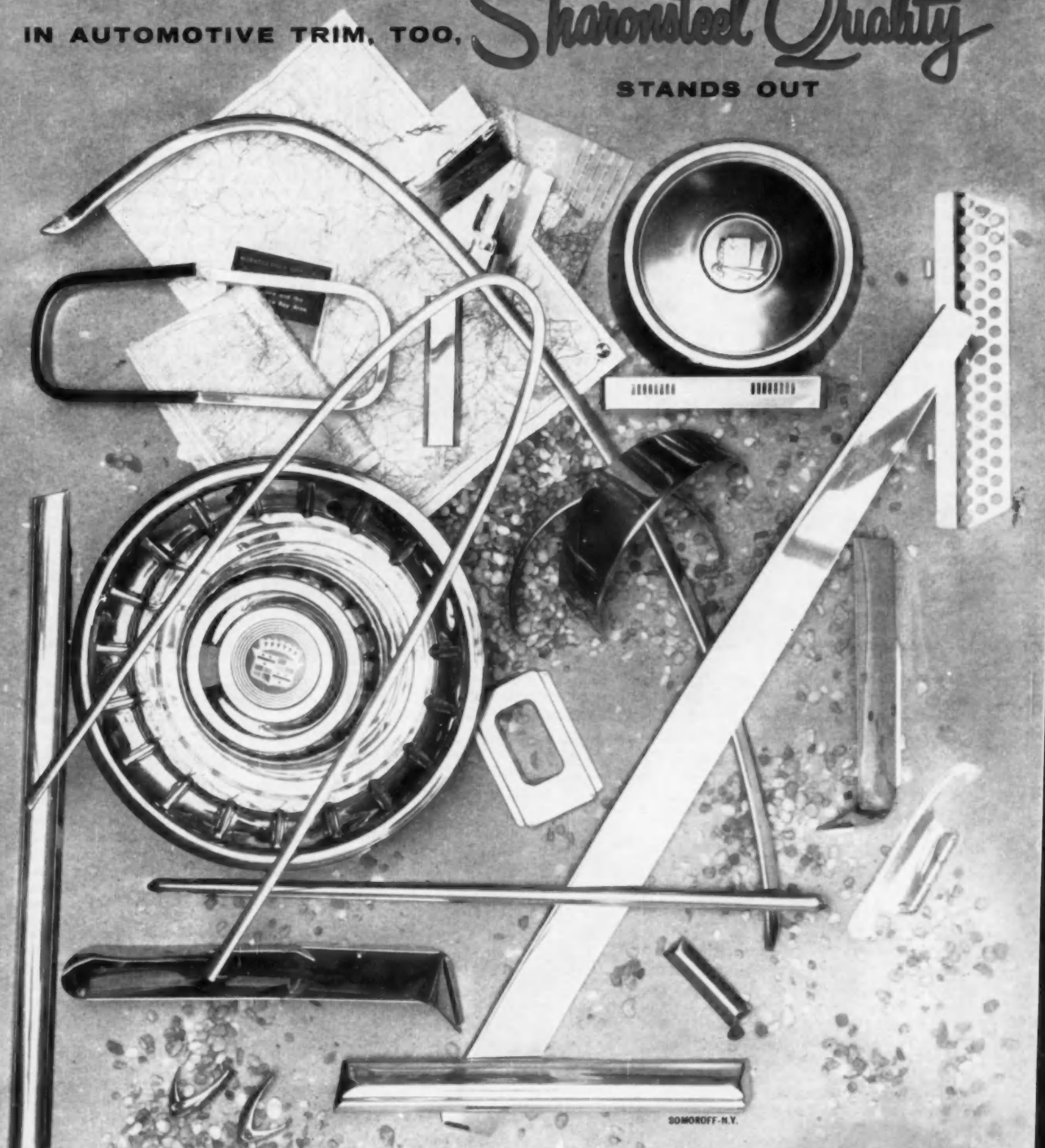
*Trade-Mark
J-22019

YOU CAN BE SURE... IF IT'S

Westinghouse



IN AUTOMOTIVE TRIM, TOO, *Sharonsteel Quality* STANDS OUT



Only Stainless Steel has really *lasting* beauty that defies flying stones, road chemicals, salt air, rust and corrosion season after season. Discerning automotive designers used more Sharon Stainless Steel this year than ever before for exterior and interior trim and accessories.

SHARONSTEEL

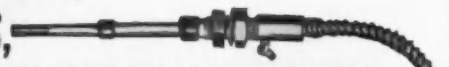
For 56 Years a Quality Name in Steel

SHARON STEEL CORPORATION, SHARON, PENNA.

176

CHICAGO, CINCINNATI, CLEVELAND, DAYTON, DETROIT, GRAND RAPIDS, INDIANAPOLIS, LOS ANGELES, MILWAUKEE, NEW YORK, PHILADELPHIA, ROCHESTER, SAN FRANCISCO, SEATTLE, MONTREAL, TORONTO

MORE EFFICIENT DESIGN, IMPORTANT SAVINGS, SIMPLIFIED ASSEMBLY, BETTER APPEARANCE



These are some of the many benefits reported by Design Engineers who have adopted TRU-LAY PUSH-PULLS for remote control operations on literally hundreds of products

Here are typical comments recently received from equipment manufacturers whose machines or implements are equipped with these accurate and dependable remote controls:

Saves Time, Labor and Material
"The use of your flexible Push-Pulls saves us a great deal of time, labor and material. The old linkages frequently required much planning in both engineering and shop which is not required now. On some of our equipment we use Push-Pulls from 10 to 30 feet in length. They operate clutch controls on the Main Power Unit, Feed Conveyors and Delivery Conveyors."

Greater Flexibility of Design
"The principal advantage of Tru-Lay Push-Pulls in our application is that they permit flexibility in locating the control valve in relation to the operator's position."

Cost Less to Install
"Tru-Lay Push-Pulls are easier and less expensive to install than linkages for remote control of power take-off, brake and clutch. Better appearance, too."

Simple and Neat
"For several models of farm tractors, we selected your controls for their simplicity and neatness of application as governor controls."

Solution to Tough Problem
"Can be installed where straight rods are impossible . . . for Remote Control of transmissions, brakes and clutches."

Eliminates Maintenance
"Simple operation and elimination of maintenance problem are the major advantages in using your Push-Pulls."

Reduces Number of Parts
"Your Push-Pulls have eliminated links, radius rods and other lost-motion devices for remote control of hydraulic valves."

Provide ACCURATE Control
"Tru-Lay Push-Pull control cables provide minimum back-lash, even in installations up to 30 feet in length, because the cable is designed to close tolerances with minimum drag and lost motion."

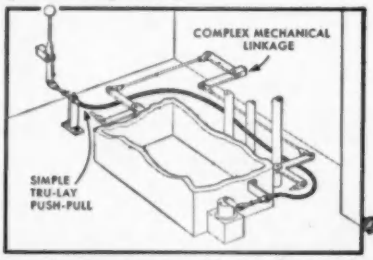
• • •

TRU-LAY PUSH-PULLS are "Solid as a rod but *Flexible* as a wire rope." This flexibility makes it possible to snake around obstructions . . . permits the ideal arrangement of all elements of remote controls.

***Advantages** of Tru-Lay Push-Pull flexibility and simplicity are pictured below—*

Simplicity vs Complexity

Compare the TRU-LAY PUSH-PULL cable in illustration with the mechanical linkage. PUSH-PULLS are simple, have but one moving part, are noiseless and give lifetime service accuracy. Linkages are complex, made of many parts; they wear at many points. Their use brings increased backlash, lost accuracy and vibration rattles.



Construction Equipment and **Farm Implements** provide good examples of the wide-spread use of these accurate, simple and dependable Push-Pulls. On Power Shovels, Winches, Graders, Road Oilers, Dump Trucks, Snow Plows, Engine-driven Pumps, Crushers, Tractors, Combines, Corn Pickers, Corn Row Sprayers, Corn Detasslers, Orchard Sprayers, Power-driven Tree Trimmers, Tobacco Picking Machines and others . . .

TRU-LAY PUSH-PULLS are operating unfailingly for the remote control of Hydraulic and Air Valves, Brakes, Clutches, Transmissions, Throttles, Chokes, Governors, Power Take-Offs, Spray Nozzles, Vent Directional Fins and on many other applications.

ACCO *Our DATA FILE will answer all further questions*

AUTOMOTIVE and AIRCRAFT DIVISION
AMERICAN CHAIN & CABLE

601-H Stephenson Bldg., Detroit 2
2216-H South Garfield Ave., Los Angeles 22 • 929-H Connecticut Ave., Bridgeport 2, Conn.

There is No Worry about Failures or Maintenance Costs with TRU-LAY Push-Pull Remote Controls

Long Life is a matter of record. We have never heard of a Tru-Lay Flexible Push-Pull Control wearing out in normal service. Failures, that sometimes harass users of more complex controls, are eliminated by the use of these simple, positive-action controls.

Dependable Operation of these controls is a certainty, even under the most adverse conditions . . . HOT as jet engines (note: Tru-Lay Push-Pulls are actually performing on hot jet applications) . . . COLD to 70° F below zero . . . SOAKIN' WET . . . ABRASIVE . . . or just plain TOUGH.

Freedom from Trouble is assured because of such features as . . . full protection of the inner, working member by the tough flexible conduit . . . lubrication of the inner, working member *for life* during assembly . . . seals that keep moisture, dust and other foreign matter out of the unit . . . cold swaging of fittings that makes them integral parts of the control unit.

Accuracy is inherent in the basic design of Tru-Lay Push-Pulls. They are precision products, not gadgets.

Capacity ranges from light jobs up to jobs of 1,000 lbs. input. These Push-Pulls will handle jobs 150 feet or more from the control point.

"Solid as a rod, Flexible as a wire rope" aptly describes Tru-Lay Push-Pull Controls. This flexibility provides positive, remote action whether anchorages are fixed or movable . . . it damps out noise and vibration . . . it greatly simplifies installation of controls by reducing the number of working parts and by making it possible to snake around obstructions.

Adaptability to all sorts of mechanical situations explains, in large measure, the wide-spread application of Tru-Lay Push-Pulls. Standard anchorages, fittings and heads have been designed that meet requirements on approximately 80% of the installations. Simple modifications of these standards, or minor changes in your own design, cover almost every special situation. Our engineers have the know-how on such matters, and will work with you.

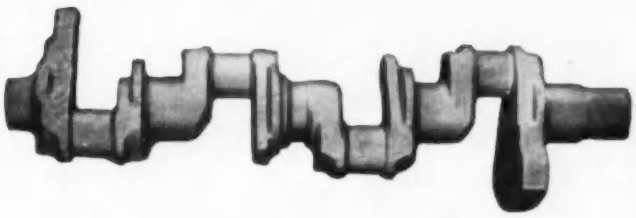
For Further Information—The DATA FILE pictured at the left contains six booklets and bulletins that will answer any further questions you may have about this versatile and dependable tool. It is quite likely that this material will point the way to a simplified solution of your remote control design problems. Write for a copy.

whether you think in terms of

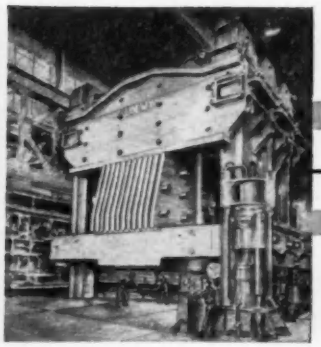
Horsepower

or

Thrust

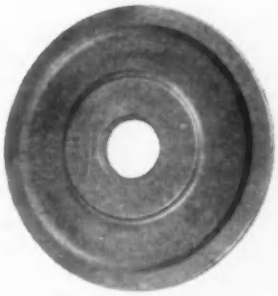


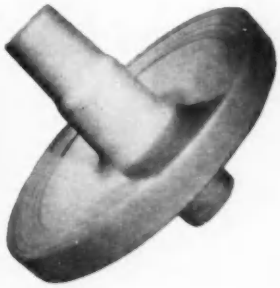
The crankshaft is the backbone of the piston-type engine. Illustrated above is the crankshaft forging for the most powerful piston-type aircraft engine ever produced.



The history of Wyman-Gordon's contribution to aircraft progress dates from the inception of the "flying machine". The jet age is now calling on the unparalleled resources of Wyman-Gordon, which include the widest range of hammer and press equipment and the greatest technical know-how in the industry. Larger and more intricate forgings than heretofore available of aluminum and magnesium are being produced on presses up to 50,000 ton capacity, and giant hammers are fulfilling the growing need for forgings of titanium, high density materials or so-called super alloys. Now, as for nearly 75 years, there is no substitute for Wyman-Gordon experience and ability for — Keeping Ahead of Progress.

At the bottom left is a turbine disc forging made from high density heat resisting alloy, and next to it is a titanium compressor wheel forging for two of the most powerful jet engines yet produced.





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CALENDAR

OF COMING SHOWS AND MEETINGS

ASME Heat Transfer Conference, Penn State, University Park, Pa. .....Aug. 11-15
Bendix-Scintilla International Ignition Conference, annual meeting, Sidney, N. Y. .....Aug. 20-22
Western Electronic Show and Convention, Cow Palace, San Francisco, Calif. .....Aug. 20-23
American Institute of Electrical Engineers, Pacific meeting, Chinook Hotel, Yakima, Wash. Aug. 28-30
Leipzig Fair, Germany .....Sept. 1-8
Farnborough Air Show, England.Sept. 2-8
Canadian International Air Show, Toronto, Ont., Canada .....Sept. 6-7
American Institute of Electrical Engineers, Petroleum Industry Conference, Sheraton Hotel, Philadelphia, Pa. .....Sept. 9-11
SAE Tractor and Production Forum, Hotel Schroeder, Milwaukee, Wis. .....Sept. 9-12
Instrument Automation Conference and Exhibit, Auditorium, Cleveland, O. .....Sept. 9-13
National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J. .....Sept. 11-13
Fifth European Machine Tool Exhibition, Hannover, Germany Sept. 15-24
American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago, Ill. .....Sept. 17-20
American Machine Tool Distributors Association, annual meeting, Hotel Cleveland, Cleveland, O. Sept. 22-24
ASME Petroleum Mechanical Engineering Conference, Mayo, Tulsa, Okla. .....Sept. 22-25
Standard Engineering Society, annual meeting, Hotel Commodore, New York, N. Y.....Sept. 23-25
ASME Fall Meeting, Statler Hotel, Hartford, Conn. .....Sept. 23-25
Material Handling Institute, Joint-Industry fall meetings, Greenbrier Hotel, White Sulphur Springs, W. Va. .....Sept. 30-Oct. 1
SAE National Aeronautic Meeting, Production Forum, and Engineering Display, Hotel Ambassador, Los Angeles, Calif. ...Oct. 1-5
National Electronics Conference, Hotel Sherman, Chicago, Ill..Oct. 7-9
ASLE-ASME Lubrication Conference, Royal York Hotel, Toronto, Ont., Canada .....Oct. 7-9
American Institute of Electrical Engineers, fall general meeting, Morrison Hotel, Chicago, Ill. Oct. 7-11
ASME - AIME Fuels Conference, Château Frontenac, Quebec, Canada .....Oct. 10-12
Pressed Metal Institute, annual meeting, Castle Harbor, Bermuda .....Oct. 13-17
American Society of Civil Engineers, annual meeting and show, Hotel Statler, New York, N. Y. .....Oct. 14-18
International Motor Show, Earls Court, London, England ...Oct. 16-26
National Conference on Industrial Hydraulics, Hotel Sherman, Chicago, Ill. .....Oct. 17-18
ASME Power Conference, Americus Hotel, Allentown, Pa...Oct. 21-23
Computer Applications Symposium, Hotel Sherman, Chicago, Ill. Oct. 23-24

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UDYLITE HI-Q ZINC ANODES
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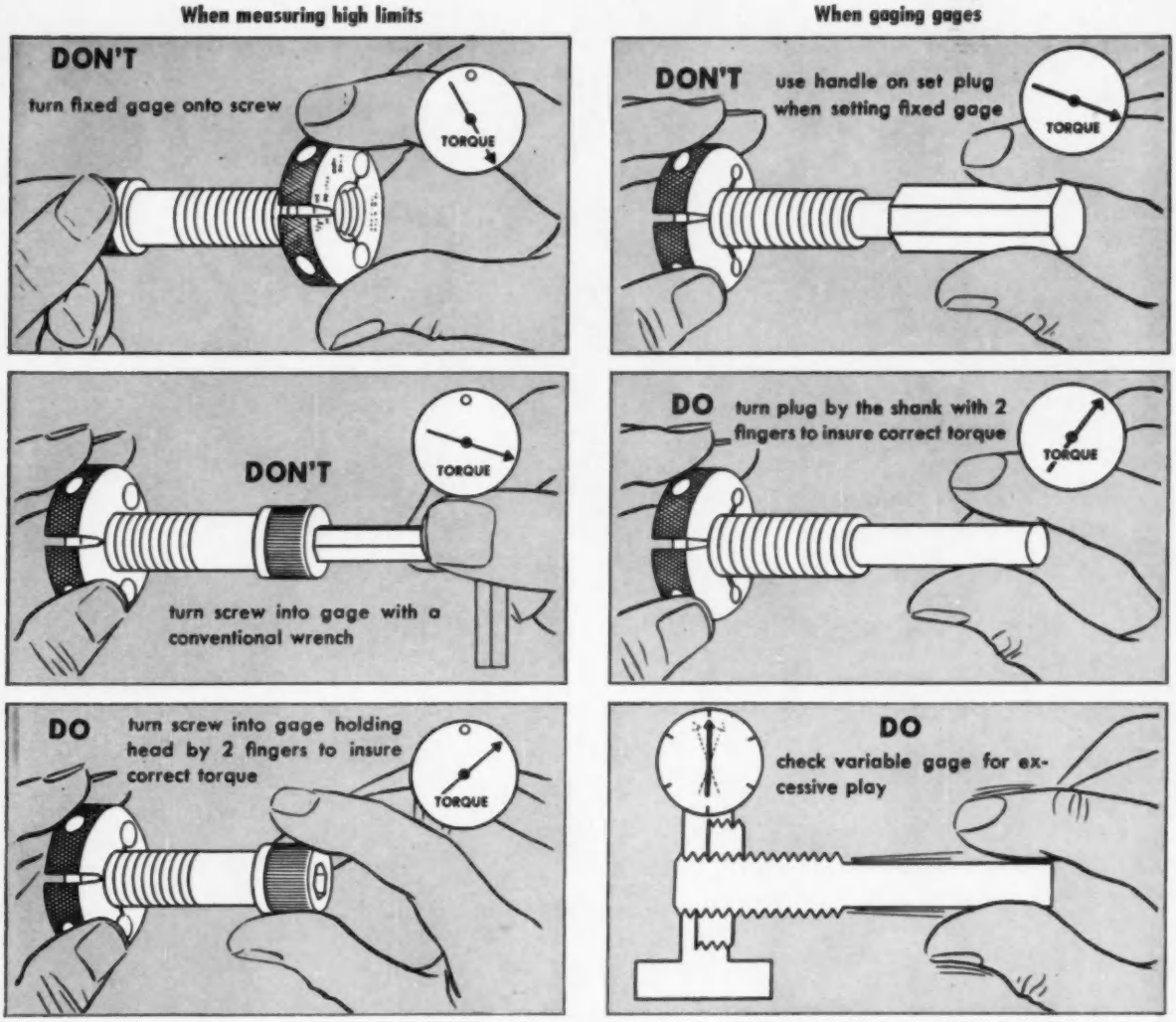

These illustrations from new SPS booklet show some of the do's and don'ts of gaging precision threads.

3A threads: what they are; how to gage them — new SPS booklet tells all

Threads made to Class 3A fit are the most precise in general use in industry. But you do not always get the 3A precision you specify. Because of many different gaging techniques that yield varying results, screws with threads well outside the Class 3A tolerance limits often pass inspection.

SPS has prepared a new booklet on this subject. It explains clearly what Class 3A threads are and the pros and cons involved in the widely varying gaging techniques in use today. It reviews the gaging of high and low limits of 3A threads, sampling techniques, and even the methods of gaging gages.

All standard UNBRAKO socket screw products fall within specified tolerance limits *no matter what method is used to gage them.* Leading industrial distributors carry complete stocks. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 53, Pa.

We also manufacture precision titanium fasteners. Write for free booklet.

Form 2239, "Class 3A Threads: what they are; how to gage them." 16 pages, with many illustrations. Write for free copy today.

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UNBRAKO SOCKET SCREW DIVISION SPS

JENKINTOWN PENNSYLVANIA

SURE, POWER STEERING MAKES THE JOB EASIER. BUT IT'S THE ADDED SAFETY THAT COUNTS MOST.
OUR POWER-STEERED RIGS STAY ON SCHEDULE BETTER, TOO.
EITHER WAY, POWER STEERING MAKES GOOD BUSINESS SENSE.

THE CASE FOR POWER STEERING ON TRUCKS!

The trend to power steering on trucks is based on one very practical reason—operators of trucks equipped with power steering have invariably found that the added safety and greater operating efficiency of their vehicles have demonstrated that power steering is indeed a sound investment.

Truck drivers using power steering report less tension and fatigue in normal driving and appreciate the positive control that blocks road shock from chuck holes and prevents loss of control if the truck is forced out on a soft shoulder.

The dispatcher knows the importance of regularly maintained schedules. He is quite aware that with power steering drivers are more relaxed and are better drivers than tired drivers. Thus, power steering not only reduces the hazard of road accidents, but helps the driver to maintain established schedules through better vehicle control.

In short, power steering, by saving time and money, contributes materially to a more profitable operation.

Truck manufacturers are always eager to offer their customers features that will make truck operation safer and more profitable and, at the same time, give their dealers every selling advantage.

That's why more and more truck manufacturers are offering performance-proven Bendix* Power Steering as original factory equipment.

If you would like to know why power steering for trucks is perhaps even more logical than power steering for passenger cars, we have prepared an interesting folder on the subject.

Write for your copy today. We think you'll be convinced. *REG. U.S. PAT. OFF.

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AVIATION CORPORATION

AUTOMOTIVE INDUSTRIES

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High Spots of This Issue

▼ Autocycling Process for Aluminum Surface Treatment

A revolutionary approach to the surface treatment of aluminum aircraft components increases the number of parts handled by conventional methods. Developed at B-6 Douglas El Segundo Div. the process uses two tanks instead of the ten or more formerly used. Page 48.

▼ Outlook for Polish Motor Industry

The large number of western vehicle manufacturers who participated in the Poznan fair in June reflects renewed interest in the Polish market. Besides reporting on the new models shown there, the writer discusses trends in the Polish motor industry. Page 52.

▼ The Aerobilt Semi-Trailer

Aircraft aluminum fabrication techniques have been applied to the construction of a new semi-trailer, and have resulted in substantial weight saving, easier maintenance, greater simplification, as well as increased tire life and safety. Page 54.

▼ Improving Automotive Products with Silicones

The nature of silicones and the wide variety of applications in industry of this versatile synthetic are covered in this timely article. The growing use of silicone products in the automotive industries since World War II is emphasized. Page 58.

▼ Semi-Permanent Mold Process for Torque Converters

International Harvester Co. is producing aluminum alloy torque converter elements to close tolerances by centrifugal casting. The entire procedure is described in detail, including the unique plaster formulation used in making up the cores. Page 60.

▼ 33 New Product Items and Other High Spots, Such As:

Extensive transfer lines; special machines at Ford plant; Lloyd 600; steel conveyor belts at Chrysler; new rear-engine Fiat; silver brazing oil pan pushing; new Rover Diesel; overhead rail setup; ASAE meeting; sheathed-tube cores; and industry statistics.

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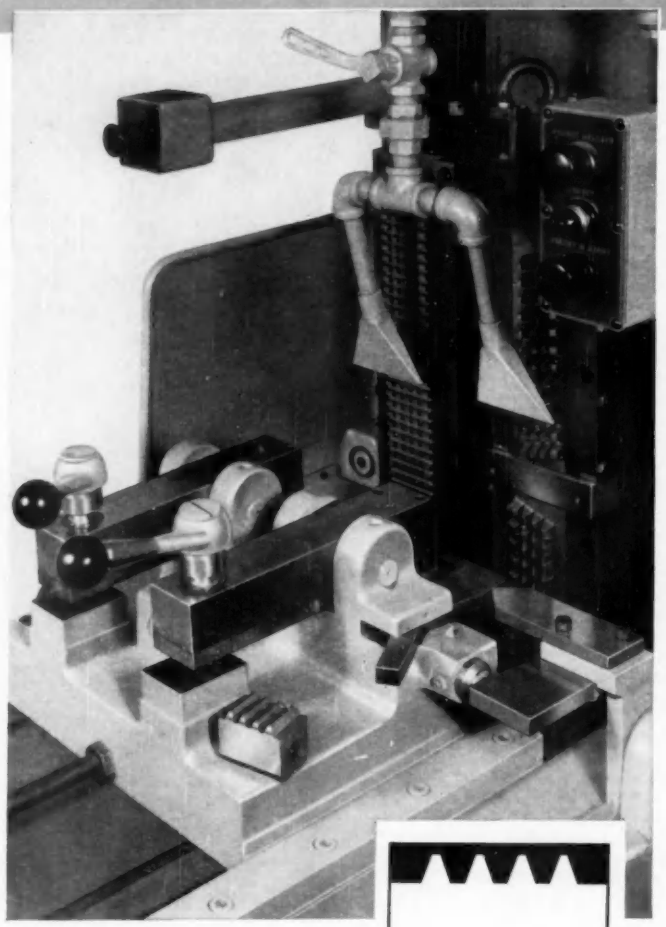
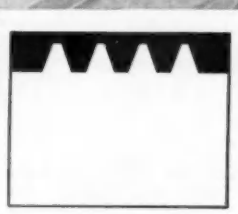
Operation Rack Teeth

Completed in Two Steps on Cincinnati Hydro-Broach Machine

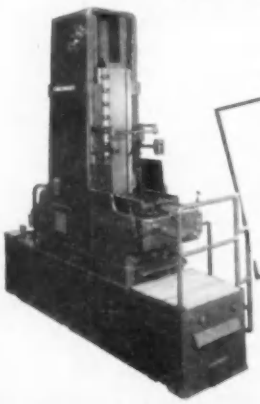
A lot of metal is removed while machining coarse pitch rack teeth. Depth of cut may appear excessive for broaching, but with proper tooling, the broaching method can be highly successful. The CINCINNATI® Single Ram Hydro-Broach Machine illustrated here turns in an excellent performance record for a job of this type... broaching four unevenly spaced rack teeth. Total depth of cut about 7/16". The fixture is a manually operated, two-station progressive type. The top of the teeth are broached in the left-hand station, and depth of teeth in the right-hand station. ¶ The machine is built for heavy duty work. Ram and table ways are hardened and ground; automatically pressure lubricated; square gibbed with narrow guides. Table advances to positive stop and automatically clamps. Convenient chip removal from front of machine, while the operator is working. 20 to 30 hp drive. ¶ Heavy stock removal operations are a problem in every shop, especially where a considerable volume of production must be maintained. Perhaps you could do a better job at lower cost on CINCINNATI Hydro-Broach Machines. Our Engineering Service Specialists are ready to give you the benefit of their experience. May we hear from you?

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO





Drawing of part. Black area indicates metal removed. Total depth of cut about 7/16" max.



CINCINNATI
SINGLE RAM VERTICAL
HYDRO-BROACH MACHINE
Catalog No. M-1745-1

Production data:

Part name	Ball nut
Material	Steel
Operation	Broach top and rack teeth
Production	100 per hour
Machine	CINCINNATI No. 10-66 Single Ram Vertical Hydro-Broach

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MILLING MA... ...ROACHING MACHINES • CUTTER AND TOOL GRINDERS
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News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 117, No. 3 **August 1, 1957**

AMC Not Planning to Employ V-4 Engine in Metropolitan

American Motors Corp. will not transfer its lightweight, air-cooled V-4 engine to the Metropolitan. The British-made car will continue to use the Austin engine currently installed, despite reports that AMC wants to use its own V-4.

Production and assembly problems stand in the way of a switch. The Metropolitan is made in England (by Austin) and AMC's small engine is made only in Detroit by the company's Special Products Div.

Edsel Turns Out 659 Cars In First Production Week

Edsel Div. of Ford Motor Co. built 659 cars during its first week of production—through July 19—and expected to have 20,000 cars in dealers' hands by public announcement time.

Plants in San Jose, Calif., Mahwah, N. J., Louisville Ky., and Somerville, Mass., are assembling the new car. Lincoln Div.'s old plant at Wayne, Mich., will start building Edsels and Mercurys in August. A sixth Edsel plant, at Los Angeles, is still under construction, and no date has been set for production.

J. C. Doyle, Edsel general sales and marketing manager, said that the press introduction would be held August 27-28, at Dearborn, Mich., and that the public announcement would follow "in another ten days or so."

Novi Plant Begins Production Of '58 Lincoln With Unit Body

Production of 1958 model Lincolns began this month at the division's new plant at Novi, Mich. The centering of all manufacturing operations in the 1.5 million sq ft Novi plant makes both economical and practical Lincoln's well-known intention to switch to unit body construction for the new models.

Other car manufacturers are expected eventually to go to this type of construction also. However, they do not find it feasible at present, due to more centralized production operations and heavy investments in existing facilities.

The Continental has bowed out as a separate car, and the 1958 Mark III will head off the Lincoln line. While sharing the same basic body shell with other Lincoln models, the Continental will not have the distinctive appearance or price of its forerunners. Top price will be around $7500 plus for the convertible.

The 1958 Lincoln will be longer in wheelbase and overall length than current models, and a new engine will offer more horsepower, a greater displacement, and a higher compression ratio. Air suspension will be available on all models.

HILLMAN STATION WAGON HAS LARGE CARGO SPACE

Hillman station wagon, made in Britain by the Rootes Group, features a four-door body based on the Minx sedan. Rear seat folds flush with the floor to provide a flat cargo area with 700-lb load capacity. Engine is the standard 84.79 cu·in. unit with an 8 to 1 compression ratio and an output of 51 bhp at 4600 rpm, it is stated.

Scotsman Series Is Sold Out Before Completion of Output

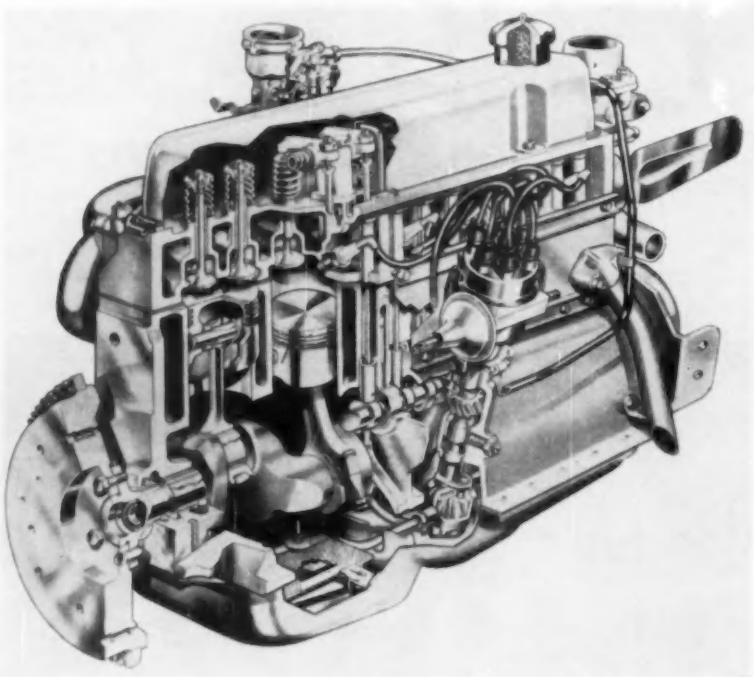
Studebaker's new Scotsman series, introduced in May was sold out before the factory ended production. The company was forced to increase its original forecast from 6000 to about 11,000 units, but no more dealer orders were taken during the last two weeks of July.

Studebaker, satisfied with the quick acceptance of the low-priced Scotsman, will continue to use the series as a leader line during 1958.

Diamond T Is Awarded New Army Truck Order

Diamond T Motor Car Co. has received a $5.5 million contract to build its M-139 six-wheel drive truck for the Army. The company already is producing the five-ton truck under earlier Army contracts of some $20 million. The new contract calls for 450 trucks.

NEWS AUTOMOTIVE AND AVIATION



VAUXHALL INTRODUCES NEW SIX-CYLINDER ENGINE

This new six-cylinder engine, introduced by Vauxhall (GM) in Britain, will be fitted to existing Velox and Cresta models. Although it has the same 137.9 cu in. displacement as the previous power unit, maximum output is increased by 22 per cent to 82.5 bhp at 4400 rpm with 7.8 to 1 compression ratio. Gross torque is up to 124 lb ft at 1800 rpm. Good breathing and improved volumetric efficiency have been incorporated.

Motor Products Completing Its Program of Liquidation

Motor Products Corp., sold its Deepfreeze Div. plant last month (July) for $700,000. The company will end all current manufacturing operations in September or October and sell its remaining Detroit plant and equipment. Motor Products will have some $11 million to spend on acquiring new operations when liquidation is complete.

Venezuelan Assembly Facility Is Acquired by Chrysler Corp.

Chrysler Corp. has purchased for an undisclosed amount an assembly plant located at Caracas, Venezuela. Called Enamblaje Venezolana, it has been assembling Chrysler products since 1949 under a franchise agreement.

The 200,000 sq ft plant has a capacity of 35 passenger cars and 15 trucks per day. Assembly and distribution will continue under the direction of plant manager James Ross, formerly with Dodge Truck in Detroit.

Clean-out of 1957 Ramblers Seen Before New Models Out

American Motors Corp. will clean up its inventory of 1957 Ramblers before introduction of new models in mid-fall to give dealers a flying start on 1958 sales.

Rambler ended production of current models in July with an estimated 16,000 to 18,000 unsold cars—not enough to carry through until the 1958's are ready to market. Some Rambler dealers already are taking a wider margin on current model prices.

June sales of 12,810 units set an all-time record and indicate a strong finish for Rambler this year. Previous high month was May, 1957.

Curtiss-Wright Develops Fuels To Re-Fire Flame-outs in Jets

Curtiss-Wright Corp. has developed and successfully tested fuels that ignite on contact with air and which can re-light jet engines which have "flamed-out" at high altitudes.

The company said the results of simulated altitude tests indicated that the discharge of a small quantity of the freely igniting fuels in an engine combustion chamber results in successful ignition at altitudes up to 52,000 ft. Ignition at even higher altitudes is also believed possible.

The "pyrophoric" fuels are composed of a mixture of aluminum trimethyl and aluminum triethyl. They have been under development and evaluation by Curtiss-Wright for several years.

Du Pont Sets Up Mylar Section At Its Circleville, O., Plant

Du Pont Co. has revealed that its Film Dept. has set up a Mylar polyester film technical section at its Circleville, O., plant. It will do process and technical development work on Mylar polyester film.

The company also announced that new facilities are being installed at the Circleville plant to increase its productive capacity by 50 per cent. The new facilities are expected to be ready for operation in the spring of 1958.

J&L to Expand Stainless Work At Louisville, O., Facility

Jones & Laughlin Steel Corp. has reached an agreement to purchase certain property of The Louis Berkman Co. at Louisville, O., near Canton. The property, which consists of land and buildings, will be used by J&L for installation of flat rolling equipment for its Stainless Steel Div.

Actual operations are expected to begin in the third quarter of 1958. In the transaction, J&L will acquire buildings with a total area of about 260,000 sq ft, and 140 acres.

AC Spark Plug Div. Is Awarded $38 Million Air Force Contract

AC Spark Plug Div. of General Motors has received a $38 million contract for research, development, and production of inertial guidance systems for the Air Force Thor intermediate range ballistic missile. Work on the program is being done in Flint, Mich., and at plants in Milwaukee. AC currently is working on two other missile programs, in addition to the Thor gyro systems.

Ford Retail Sales Increase In First Six Months of '57

Retail sales of all Ford Motor Co. passenger cars totaled 956,834 for the first six months of 1957, compared with 846,895 cars for the corresponding period last year, an increase of 13 per cent.

Truck retail sales of 155,924 for the six-month period brought the total vehicle count to 1,112,758, topping last year's figure of 988,040.

Passenger car sales for the month of June were 170,142, units an increase of 13.9 per cent over last year and 5.2 per cent over 1955. Truck sales for June were 31,437 units, a 33.8 per cent increase above the previous June and 30.6 per cent above June, 1955.

Consolidated sales for the six-month period totaled $3,009,500,000, up 27 per cent over sales in the first half of 1956. Consolidated net earnings were $171 million, a 30 per cent increase over the $131,700,000 earned in the same period last year.

Factory sales of cars and trucks in the first half of 1957 amounted to 1,195,592 units, including 1,009,463 passenger cars and 186,129 trucks. This was the second highest first-half in the company's history and was exceeded only by the corresponding period in 1955.

Oldsmobile to Celebrate 60th Anniversary This Month

Oldsmobile Div. of General Motors Corp. will mark its 60th anniversary Aug. 21. Incorporated by Ransom E. Olds and a group of Lansing, Mich. backers for $50,000, the company built a five-cylinder buggy, and production totaled six vehicles the first year.

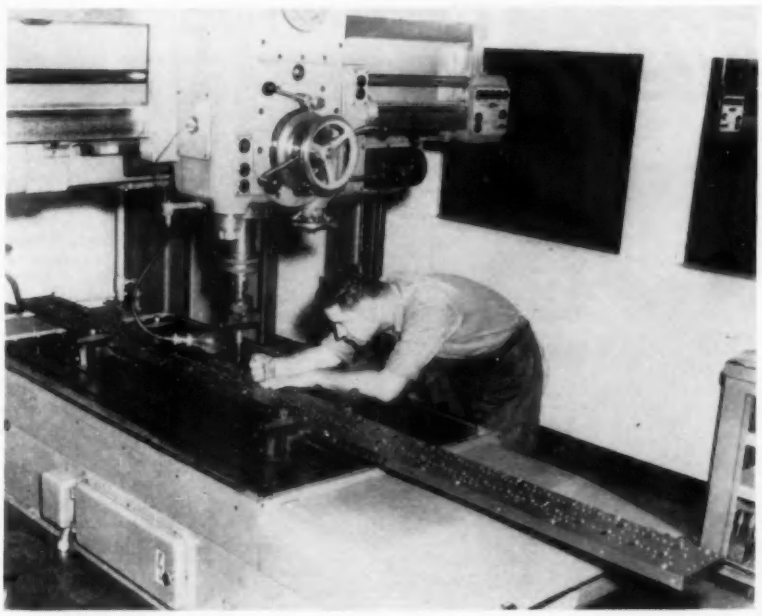
Since that time Oldsmobile has produced nearly six million vehicles. In the first half of 1957, the division built 236,361 cars.

AMC of Canada to Import Cars From U.S. While Plant Is Readied

American Motors (Canada), Ltd., will import the full line of Nash, Hudson, and Rambler cars from the U. S. during 1958 while a new Canadian factory is being built at Toronto. AMC shut down its former Canadian plant at the end of the 1957 model run in July, and the 211,000 sq ft facility will be sold.

Plans for the new plant on a 20-acre plot have not yet been completed. The Canadian company does, however, intend to build the full American Motors line and enter the export field, probably by 1960 or 1961.

While Canadian dealers are being supplied from the parent factory at Kenosha, Wis., the Canadian subsidiary expects prices for 1958 to be "more competitive than ever," despite import duties and shipping costs.



METAL SWISS CHEESE FABRICATED BY JIG BORER

Giant 11-ft die holder for new automated production line of Standard Pressed Steel Co. is shown here on precision optical jig borer. The borer is machining more than 800 holes in the three-in diam dieholder. The fabrication will hold a total of 188 piercing dies to be used by SPS in making its new line of Erectomatic adjustable shelving. A mating tool holder contains the piercing tools that will punch the 188 holes into pressed steel shelving uprights. It is all done in one stroke of a 1000-ton press. Borer can spot holes in dies to within 1/25,000 in. in a six-ft length.

Nylon Tires Will Continue Optional on Most '58 Cars

Nylon tires will be optional equipment on regular production model cars during the coming year, despite a narrowing of the price gap between nylon and rayon. Some limited production models, such as the Rambler Rebel, will have nylon cord tires as standard equipment.

Nylon tires currently run 10 per cent higher in price than rayons on the replacement market. Their wider acceptance as original equipment presumably could bring the price down closer to or even below rayon tire prices, since less nylon is required in making a tire.

Truck fleet operators already are switching to nylon tires. Dodge, for example, receives 25 to 30 per cent of its truck orders with nylon casings specified.

Chrysler Gets $16 Million Contracts for Army Trucks

Chrysler Corp. and its subsidiary, Chrysler Motors Corp., have received two contracts for trucks totaling nearly $16 million from the Army.

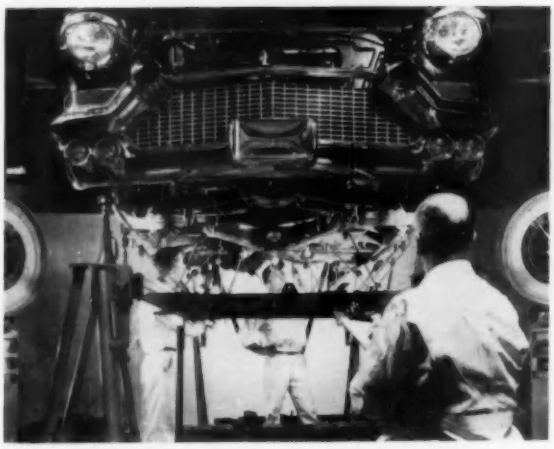
One contract, which totals $1,828,044, covers development of a new lightweight family of trucks ranging from 1 to 2½-ton payload capacities. The second contract, of about $14 million, is for a number of ¾-ton, 4 x 4 tactical Dodge trucks. Production is scheduled to begin in December, at the Dodge Truck Plant, Warren Township, Mich.

Non-Volatile, Water-Base Paint Being Used in Some Ford Plants

Ford Motor Co. has developed a new non-solvent, water-emulsion paint which uses water, rather than a volatile thinner, as a base. The new paint, already used at Ford's Monroe parts plant and Dearborn frame and standard transmission and radiator plants, was under development for two years.

Since it is non-solvent, the paint does not produce inflammable fumes, thus reducing fire danger. Ford reports the paint has the durability of paints formerly used.

News AUTOMOTIVE AND AVIATION



TORSION TEST

Network of sensitive dials gives General Motors engineers at the Technical Center instant reading in this beaming and torsional test as they apply loads to various sections of a Cadillac tubular center X-frame. Slightest deflections of the frame structure are detected as the Cadillac chassis and body rest on a level, rigid test bed. The same technique is used to test experimental frame and body designs.

More Car Manufacturers Report High Sales of Air Conditioners

Cadillac, Buick, Dodge and American Motors have joined the list of automobile manufacturers who attest to the growing acceptance of air-conditioned cars. Cadillac has now installed nearly 130,000 units since it first announced air-conditioning in 1953; its current rate is 35 per cent of total vehicle production. Buick's sales of cars factory-equipped with air conditioners have gone up 28 per cent this year.

Dodge's all-weather air conditioning sales have jumped from 1332 during the 1956 model year to an expected 7000 units this year. Dodge believes that air conditioning sales no longer are seasonal.

American Motors reports that sales of its air-conditioned Nash and Hudson models have doubled this year and now account for 15 per cent of production. Nine per cent of the current Ramblers have factory-installed air conditioning.

Alcoa Doubles Former Capacity Of Its Davenport, Ia., Works

Aluminum Co. of America recently unveiled the results of a $54 million expansion program at its Davenport, Ia., Works. The additions to the $130 million plant provide impressive capacity to produce aluminum sheet and plate. New foil rolling facilities broaden the operation's versatility.

Altogether, the latest expansion virtually doubles the peacetime capacity of the mill.

New production units unveiled include: a 160-in. hot mill; a plate stretcher with a pulling force of 16 million lb operated by Alcoa for the Air Force; a 100-in. cold mill for finish rolling wide, coiled aluminum sheet; plate heat-treating and aging furnaces, able to accommodate plate in 60-ft lengths; and a $13 million foil rolling facility with an annual capacity of 24 million lb.

The new mills are teamed with a 144-in. rolling mill, installed in 1954 under an Air Force contract. In combination, the mills and their related facilities now form the major production unit in the U. S. for the rolling, heat treating, and leveling of aircraft sheet and plate in tapered form.

More Car Seats to Contain Naugahyde Material in '58

More cars will carry U. S. Rubber Co.'s Breathable Naugahyde seat upholstery material in 1958. The vinyl and fabric combination will appear on the entire Studebaker Scotsman line and one other passenger car, along with a Studebaker truck.

Other models using Naugahyde will be a Mercury convertible, Ford retractable hardtop (which used it in '57), Plymouth Plaza Suburban and Belvedere convertible, the top Dodge truck model, and a Chrysler convertible. Chrysler has used Naugahyde on some models since 1955.

Breathable Naugahyde is a deposit vinyl on broken twill fabric with 40 per cent open fabric. It is said to allow better air circulation.

First Mechanical Mules Due To Be Built by Willys Soon

The first Mechanical Mules will be built by Willys Motors, Inc. by the end of August. Willys currently has military contracts of more than $6.7 million for the flat-bed, rough-terrain vehicle. Five new contracts from the Marine Corps, including one for 281 Mules, were received by Willys recently.

Willys hopes to market the Mule commercially for specialized off-highway uses. The Mule is a four-wheel drive and four-wheel steering vehicle designed to carry 1000 lb.

Hugh C. Quinn Appointed A.I. Detroit News Editor

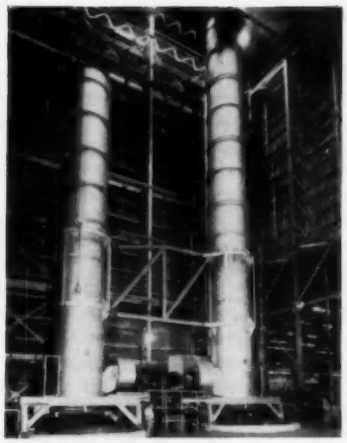
Under a continuing program of expansion and strengthening of its editorial coverage, AUTOMOTIVE INDUSTRIES has appointed Hugh C. Quinn Detroit News Editor. Joseph Geschelin remains in his post as Detroit Editor and contributor of design, engineering, and production articles.

Quinn was formerly associated with the Automobile Manufacturers Association as Editor of the publication *Automobile Facts*. He also handled public relations, promotion, and publicity for the National Automobile Show in New York last December.

Graduated from the University of Michigan in 1952 with an A.B. degree in Journalism, his working background likewise includes periods of service with various newspapers and wire services as writer, editor, rewrite man, and correspondent. He was also associated with the Kelvinator Export Div. of American Motors Corp. in sales promotion, advertising, and publications work.

The depth of A.I. editorial coverage in the vital Mid-West section of the country was further extended in 1956 with the appointment of Kenneth Rose as Mid-West Editor with offices in Chicago. Together with Quinn and Geschelin in Detroit, he will continue to report automotive and aviation developments in this important geographical area.

Hugh C. Quinn and Joseph Geschelin



10-STORY-HIGH FURNACE

The electric furnace on the right—higher than a 10-story building—heat treats giant aluminum alloy shapes for aircraft, construction, and other uses. Built by the Industrial Heating Div. of Westinghouse Electric Corp. for the Harvey Aluminum plant in Torrance, Calif., this furnace and its 70-ft high companion (left) provide controlled temperatures which multiply several times the strength of the metal.

Navy Curtails Two Programs For Development of Aircraft

The Navy has curtailed two programs for the development and procurement of new model aircraft. Two new development models are affected —the W2V-1, a long-range, early warning aircraft, and the A4D-3, an improved carrier attack model.

The developmental program for the W2V-1, under contract with Lockhead Aircraft Corp., has been partially terminated. The contract was for two lots. Lot No. 1, for the research and development phase, will continue through mock-up. Lot No. 2, for the pre-production engineering phase, has been terminated. No actual aircraft were involved.

The A4D-3 contract with Douglas Aircraft Corp. for four improved models also has been terminated.

Four Headlamps Made Legal In All States But Alabama

With all passenger car manufacturers planning to use a four-headlamp system on 1958 models, only Alabama lacks clear legislation permitting the use of the new lighting system. Alabama does have, however, both administrative approval and an attorney general's opinion allowing four headlights. A measure which would make Alabama's statute conform with the Uniform Vehicle Code is slated for approval prior to new car announcement time.

A1 TABLOID

Jones & Laughlin Steel Corp. plans to acquire Cold Metal Products Co.

* * *

Electric Auto-Lite Co. is receiving $15 million for the Evendale, O., plant being acquired by General Electric Co.

* * *

P. R. Mallory & Co., and Radio Materials Corp. have agreed on a merger. . . . Racine Hydraulics & Machinery, Inc., and Simplex Engineering Co. have negotiated a merger.

* * *

Union Carbide Corp. will build a major chemicals plant in Putnam County, W. Va.

* * *

Minneapolis - Honeywell Regulator Co. has purchased from Raytheon Mfg. Co. for $4.5 million the latter's 40 per cent stock interest in Datamatic Corp.

* * *

Bostrom Mfg. Co. has set up new research laboratories to specialize in the study of ride vibration and its effects on people.

* * *

Goodyear Tire & Rubber Co. has built a new retread and repair plant at Des Moines, Iowa.

* * *

Niagara Machine & Tool Works has established a new Boston district office at 500 Main St. in Waltham, Mass. . . . Hooker Electrochemical Co. has opened a new district sales office at 6 Penn Center Plaza, Philadelphia, Pa.

* * *

Westinghouse Electric Corp. has opened a nuclear reactor evaluation facility at Waltz Mill, Pa.

* * *

Bendix Aviation Corp. and the Atomic Energy Commission have signed a five-year contract for the continued operation of the company's Kansas City Div.

* * *

Eutectic Welding Alloys Corp. will establish new plants in Brazil and Switzerland.

* * *

Pressed Metals of America, Inc., has announced plans to confine itself to heat treating for other firms on a contract basis.

Miniature Precision Bearings, Inc., has acquired Split Ballbearing Corp.

* * *

Vertol Aircraft Corp. has formed a Subcontract Dept.

* * *

Allis - Chalmers Mfg. Co. has opened a Chicago retail branch at 4400 Archer Ave., Chicago, Ill.

* * *

Northrop Aircraft, Inc., has received from the Air Force a $73 million production order for Snark SM-62 intercontinental missiles for delivery to operational units of the Strategic Air Command.

* * *

Cessna Aircraft Co. has named it YH-41 four-place helicopter now in production for the Army the "Seneca."

* * *

Civil Aeronautics Administration has approved the Herrmann engine for aircraft.

* * *

Methode Mfg. Corp. has moved a portion of its operations to 7447 Wilson Ave., Harwood Heights, Chicago 31, Ill. . . . Fischer & Porter Co. has moved its New York sales office to 141 Main Ave., Clifton, N. J.

* * *

Park Drop Forge Co. recently celebrated its 50th anniversary.

* * *

Spectron Div. of Consolidated Electrodynamics Corp. has purchased the optical production and testing equipment of Testa Mfg. Co.

* * *

Detroit Stud Welding & Mfg. Corp. has been formed in Oak Park, Mich., to do production stud welding for automotive suppliers.

* * *

Schwitzer Corp. has completed an agreement with Holset Engineering Co., Ltd., Turnbridge, Huddersfield, England, to manufacture, sell and service its bonded rubber vibration dampers, and a range of turbochargers.

* * *

Northrop Aircraft, Inc., has developed a new low-drag boundary layer control concept.

NEWS AUTOMOTIVE AND AVIATION

CADILLAC ENGINES TESTED BY ELECTRONIC DEVICE

Here is a new electronic "brainchild" that Cadillac uses on its engine assembly line to detect unbalance. Known as the Pulse Synchronized Unbalance Indicator (PSUI), the new device literally takes the engine's "pulse" at any running speed whatsoever.

New Aluminum Powder Metallurgy Products With High Heat Resistance Made by Alcoa

New possibilities for aluminum uses in parts subjected to high temperatures have been revealed by Aluminum Co. of America with the announcement of the commercial availability of aluminum powder metallurgy products. They are said to mark a major break through the thermal barrier which has barred the use of aluminum in numerous high temperature applications.

Aluminum powder metallurgy products (APMP), created by subjecting the powdered metal to heat and pressure, now are available from Alcoa in the form of extruded shapes, forgings, sheet, foil, drawn and extruded tube, impact extrusions, fasteners, and wire.

Certain of the APM products reportedly can withstand temperatures up to 900 F. The products are made from fine, unalloyed aluminum powder, with each tiny flake being coated with aluminum oxide. When the powder is compacted and worked, this oxide coating strengthens the product and contributes stability at elevated temperatures.

One of the new APM products already is in use in standard production parts employed in a jet aircraft engine. Other uses are being found in defense and commercial equipment requiring lightweight materials able to withstand high temperatures.

Where friction is encountered in certain engine components, APM products can be anodized. The process provides a hard oxide coating to prevent moving parts from sticking. The products can also be electroplated by regular methods.

General Tire Sales Exceed $200 Million Mark in Half

General Tire & Rubber Co. reported sales for the six months ended last May 31 were $205,968,169, with estimated earnings of more than $5.8 million. Sales were 15.8 per cent above the same period of 1956.

All divisions reported gains, and the Tire Div. was well ahead of last year. Tire sales in June were 30 per cent above June, 1956, and topped the previous high month of July, 1950, the figures showed.

UAW Sees Foreign Car Imports As No Present Threat to Jobs

Officials of the United Auto Workers are not concerned about increasing imports of small European-made cars, which have more than doubled since last year and show signs of further increases. A Union spokesman said that at the present time the foreign car does not threaten the jobs of UAW members.

The Union says it is certain that, should the competition from Europe become too great, U. S. manufacturers would meet the challenge by building small cars here. At the present time, such a step does not appear feasible to the American automobile industry. For example, E. N. Cole, Chevrolet general manager, says the small-car market would have to reach a minimum of 500,000 units before it would be practical to tool up for production here.

Kaman Wins Air Force Contest For Crash-Rescue Helicopter

Kaman Aircraft Corp. has won the Air Force competition for a new local crash-rescue helicopter. Present planning indicates that procurement of the new helicopter will be initiated in the fiscal 1958 program. No dollar amounts nor quantities of aircraft were announced.

Kaman entered the competition with its present production HOK-1 helicopter carrying fire-fighting equipment slung on its external cargo hook, a rescue crew of three, and pilot. The crash-rescue helicopters built for the Air Force will be powered by piston engines similar to those used in Kaman's HOK-1 units. In later models, Lycoming T-53 gas turbines will replace the piston engines.

GM Expands Summer Program for High School Educators

General Motors Corp. is expanding its summer conference program for high school science and mathematics teachers. It will bring 39 teachers to the GM Technical Center for a one-week session from Aug. 18 to 24.

The summer program, first held last year, is designed to acquaint teachers with industrial science techniques that may be useful in their own classrooms. The teachers come mainly from GM plant cities and are employed by 24 corporation divisions during the summer. At the Technical Center session they will observe laboratory experiments and engineering demonstrations. A side trip to GM's Milford Proving Ground will be included.

GE Sales, Profits in Quarter And Six Months Exceeded 1956

Sales and earnings of General Electric Co. for the second quarter ended June 30 and for the first half of the year showed gains over the like 1956 periods.

The company in the second quarter increased net income to $63.817 million. Sales in the April through June period climbed to $1,072,460,000 from $1,012,516,000.

The GE sales and earnings for the first half set a record for the period in surpassing the previous first-half high, posted in 1956. First-half net income, the company said, increased to $127.823 million, a gain of 13 per cent from the $112.864 million in the like 1956 period. Sales in the first six months rose eight per cent to $2,121,310,000 from $1,958,974,000 in the same period last year.

High-Energy Fuels Using Boron Readied for Air Force by Olin

Olin Mathieson Chemical Corp. is now producing new high-energy fuels on a semi-commercial basis in a $5.5 million pilot plant installation at Niagara Falls, N. Y. Made from chemical compounds of the mineral Boron, the fuels are being shipped to the Air Force for use in military aircraft and guided missiles.

An interim facility, scheduled to go into production for the Navy at Niagara Falls late this year, will cost about $4.5 million and will turn out about three times the quantity of fuel now being produced for the Air Force.

A third plant near Niagara Falls will be built for the Air Force at a cost of approximately $36 million. It is expected to go into operation in the Spring of 1959 at a reported rated capacity many times that of the first.

The fuels, called HEF-2 and HEF-3, are claimed by Olin to produce considerably more energy per pound than fuels derived from petroleum. One unconfirmed report said that the new fuels would enable a B-58 bomber to fly to any point in the world and return without refueling. Olin also stated that it has completed research on an even more powerful fuel called HEF-4 and was well along with research on others.

Although output of the fuels by other companies as well as Olin will for the forseeable future be limited to the Armed Forces, it is expected that they ultimately will be used in civilian planes. The fuels now being produced are expected to be the forerunners of a $1 billion industry in the next 10 years.

Baker-Raulang Traveloader fork truck with special attachment to unload car frames.

GM Second Quarter Sales Rise Over '56 Period; Profits Off

The figures contained in the second quarter financial report of General Motors Corp. follow the pattern for the first three months of this year. Dollar volume increased to $2.837 billion from $2.804 billion in the second quarter a year ago, but net income declined to $219.878 million from $220.878 million. Unit sales of cars and trucks were 1,000,614, against 1,074,862 in the like 1956 period.

For the six months ended June 30, net income was $481.236 million on sales of $5.914 billion. These figures compared to net income of $503.471 million on sales of $5.868 billion for the first half of 1956. Current assets as of June 30 were $3.058 billion, and current liabilities totaled $1.141 billion.

Special Fork Truck Attachment Speeds Unloading of Car Frames

At the Wisconsin plant of a major automobile manufacturer, a 10,000-lb-capacity, side-loading Traveloader fork truck is being used to speed the unloading of automobile frames from rail cars. Made by Baker-Raulang Co., the unit can handle an entire stack of 22 frames in one load.

To make sure the high stack cannot topple, a simple attachment was added to the Traveloader. The device is secured to the carriage so that it moves in and out, up and down, with the forks.

Together with the forks, the attachment forms a tall rigid "C" open away from the truck body, with the forks forming the bottom arm, and channel and angles forming the top arm, the upright is pipe.

Height between the arms is slightly more than the height of a stack of 22 frames. Thus when the operator, with his hydraulic controls in the cab, moves the forks under a stack of frames, the upper arm moves over the top of the stack.

A pivoted finger hangs down from the top arm. When a load is on the forks, it hangs down inside the stack of frames. The finger can be pulled up to horizontal to clear the edges of the stack, in the direction toward the truck's cab by a line running to the cab, but is restrained by braces from swinging past vertical away from the cab. The stack cannot topple toward the cab because it would fall against the pipe uprights of the attachment. It cannot topple away from the cab because of the finger.

When a load is deposited, the operator pulls the line to lift and hold the finger so it will clear the frames. He can then retract the carriage, pulling forks and attachment clear.

The load is not balanced on forks while traveling. The driver can extend the forks to lift a load to deck height, retract the forks to bring the load over the side-loader's decks, and lower the load onto the decks for travel.

When loading and unloading, the truck is braced by two self-leveling hydraulic jacks. These are extended or retracted by means of a lever in the cab.

MEN IN THE NEWS

Cadillac Motor Car Div., General Motors Corp.—George R. Elges was made plant engineer.

B. F. Goodrich Co.—**J. W. Keener,** has been named president, succeeding **William S. Richardson,** retired.

Electric Auto-Lite Co.—**Gurdon W. Wattles** has been elected chairman of the board.

Studebaker-Packard Corp.—**Carl F. Giese** has been elected to the board of directors.

Yellow Manufacturing Acceptance Corp.—**Charles F. Sturz** has been elected vice-president in charge of branch operations, and **Albert J. Thompson** succeeds him as treasurer.

Baird Machine Co.—**Durwood A. Blaisdell** has been elected executive vice-president.

New Departure Div., General Motors Corp.—**Seth H. Stoner** has been appointed general manager.

Denison Engineering Div., American Brake Shoe Co.—**William F. Bohannan** was appointed field research engineer.

Fairchild Engine & Airplane Corp. —**W. Thomas Stark** has been appointed general sales manager of aviation products for the Stratos Div., and **Grayson Merrill** has been named director of engineering for the Guided Missiles Div.

Klemp Metal Grating Corp.—**Gerald T. Hughart** has been appointed general manager.

Champion Spark Plug Co.—**George F. Owens** has been appointed assistant sales manager.

Twin Disc Clutch Co.—E. B. Falk was named manager of advertising and sales promotion.

Zollner Corp.—Robert B. Hawkins has been appointed general sales manager, and Robert Ritchie his assistant.

American Motors Corp., Special Products Div.—**Joseph W. Eskridge** was named vice-president and general manager.

Saginaw Steering Gear Div., General Motors Corp.—**Philip B. Zeigler** has been appointed chief engineer, succeeding **C. W. Lincoln,** now technical assistant to the general manager.

Studebaker-Packard Corp. — **Byers Burlingame** and **P. A. Braner** have been elected comptroller and assistant comptroller, respectively.

Titeflex, Inc.—**Matthew J. Betley** has been named president.

Rochester Products Div., General Motors Corp. — **Harold E. Stahl** is now sales manager, and **Kenneth F. Lingg** has been promoted to assistant sales manager.

Chrysler Corp. — **J. C. Poyner** has been made director of supplier relations in the Purchasing Dept.

Micromatic Hone Corp. — **R. G. Ellis** has been named staff assistant to the vice-president and assistant general manager.

Clevite Ltd.—**William H. Martin** has been appointed president.

Ford Motor Co.—**Walter T. Murphy** is now sales promotion manager for the Marketing Staff.

Baker Brothers, Inc. —Robert A. Schafer has been appointed vice-president in charge of engineering.

Ford Motor Co.—James L. Cameron has been appointed director of supplier relations.

Necrology

Walter C. Kerrigan, 65, assistant to the president of International Nickel Co. of Canada, Ltd., and International Nickel Co., Inc., died July 16, at New Brunswick, N. J.

William P. Fisher, 44, son of Fisher Body Corp. founder Charles T. Fisher, died July 12, at Detroit, Mich.

Thomas M. Birmingham, 62, sales administration manager for the Replacement Sales Div. of Electric Auto-Lite Co., died recently, at Toledo, O.

Kershaw Harms, 58, vice-president of American Smelting and Refining Co., died July 12.

C. Lansing Hays, 76, a former treasurer of Bakelite Corp. of America, died July 14, at Northville, N. Y.

Chester L. Lancaster, 53, vice-president and manager of the Bumper Div. of Electric Auto-Lite Co., died June 26.

Paul F. McNally, Sr., 63 plant engineer of Dodge Div., Chrysler Corp., died June 24, at Grosse Pointe Woods, Mich.

Harold C. Haskell, 72, former general counsel and a director of E. I. du Pont de Nemours & Co., died June 30, at Rockland, Me.

John F. Bahm, 70, retired vice-president of General Electric Co. of South America, died June 30 at Princeton, N. J.

Gordon Lefebvre, general manager of Clark Co., died June 27, at Olean, N. Y.

Drills 417 holes at one time.

How to keep hydraulic equipment in tune

The multiple-spindle machine, shown above, is used in the production of cast iron harps for pianos. It drills 417 holes at one time—from 5/32" to 7/16". The large number of spindles makes lubrication a critical factor in keeping production humming.

That's why the machine manufacturer—Zagar Tool, Inc., Cleveland, Ohio—specifies *Texaco Regal Oil R&O* both as a spindle lubricant, and in the hydraulic system which controls the feed of the drills.

Texaco Regal Oil R&O has much greater oxidation resistance than ordinary turbine-quality oils used in hydraulic service. It effectively prevents rust and foam—assures smoother, more dependable service.

There's a complete line of *Texaco Regal Oils R&O*. Let a Texaco Lubrication Engineer help you select the one best for your job. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, New York.

TEXACO

TEXACO Regal Oils R&O

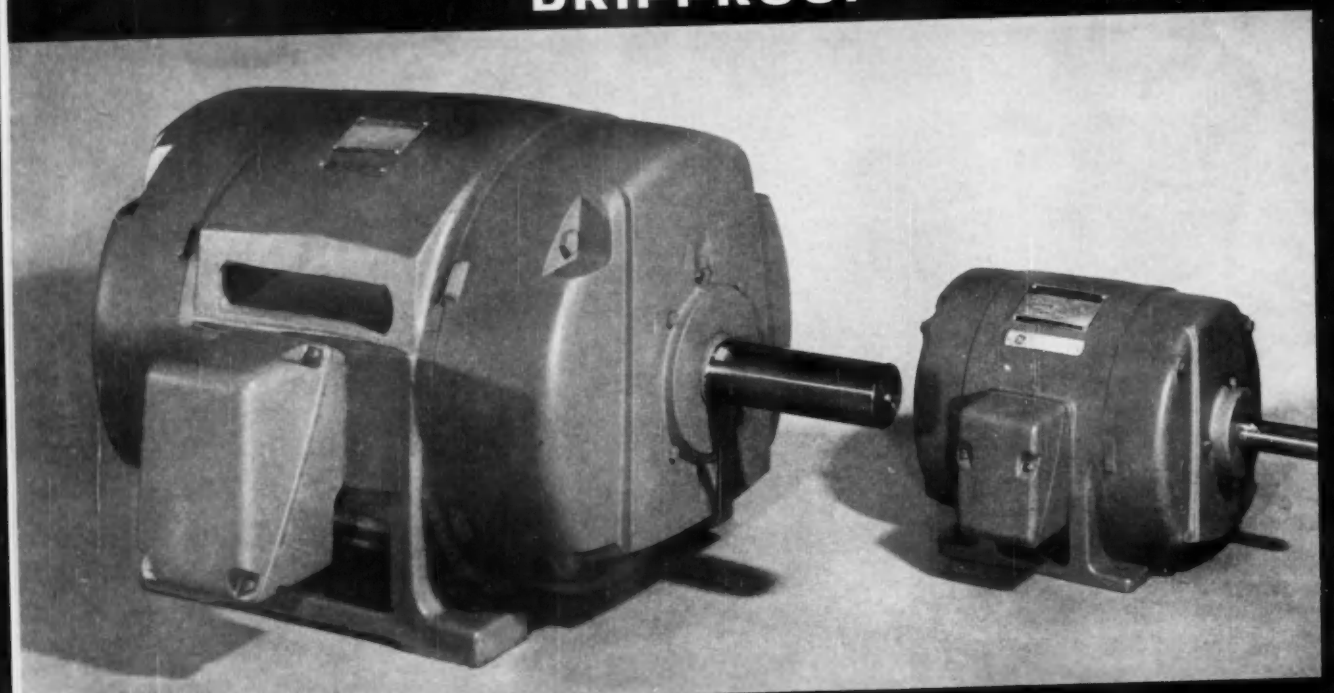
FOR ALL HYDRAULIC UNITS

immediate shipment . . . all ratings

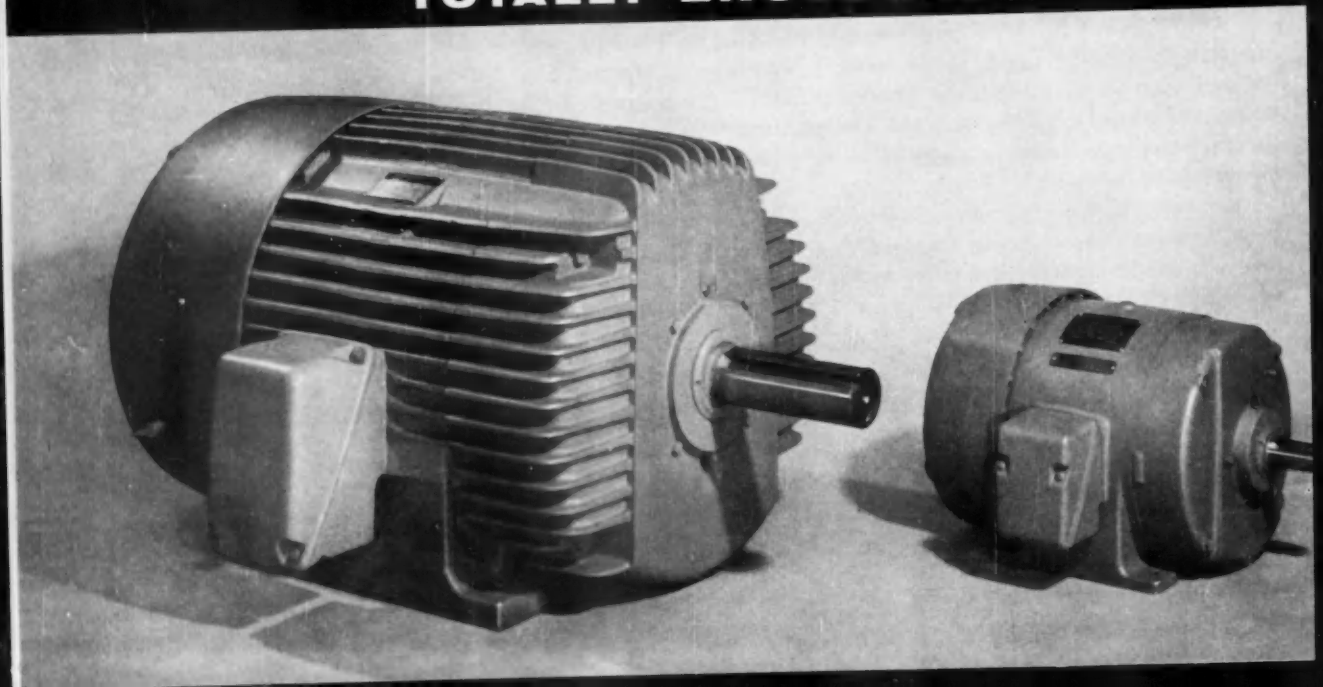
General Electric TRI 55 CLAD
REG. U.S. PAT. OFF.

NOW UP

DRIPPROOF



TOTALLY ENCLOSED

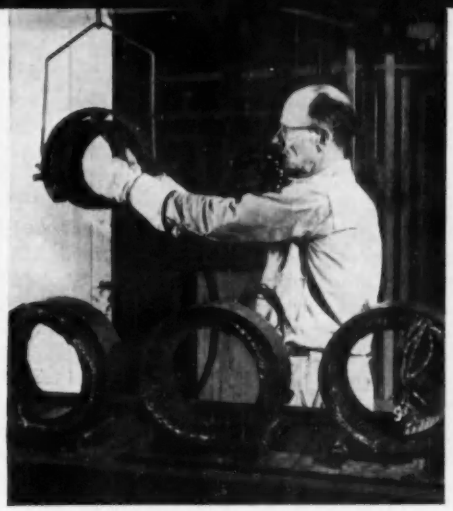


Motors in New NEMA Ratings

TO 125 HP

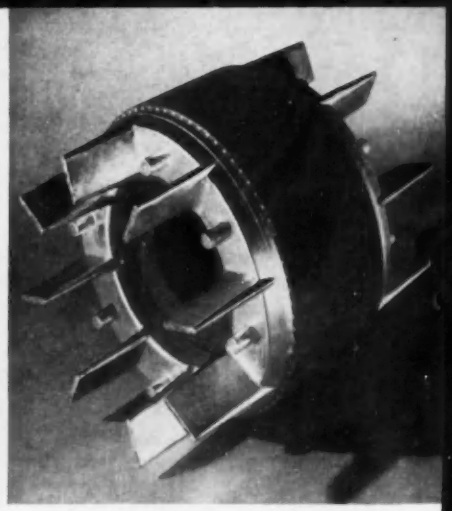
YEARS AHEAD BENEFITS

DESIGNED FOR GREATER PROTECTION—Better protected against physical damage by rugged cast-iron frame and endshields, new Tri-Clad '55' motors will handle many applications where ordinary dripproof motors cannot be applied.



BUILT TO PROVIDE LONGER LIFE—Longer stator life is provided through use of new, advanced insulation system utilizing Mylar* slot insulation, Formex® magnet wire, non-wicking Geoprene® leads and Dri-Film® silicone coating.

*Registered DuPont Co. Trade-mark.



ENGINEERED FOR TOP PERFORMANCE—Improved rotor is solid cast from commercially pure aluminum for greater strength, higher conductivity. Integrally cast rotor fans conduct heat to air stream more effectively than separately joined fans.

FOR COMPLETE INFORMATION

FOR COMPLETE DETAILS on the new line of Tri-Clad '55' motors up to 125 hp, contact your local G-E motor distributor or the sales engineer at your nearby General Electric Apparatus Sales Office. You will get expert assistance in selecting and applying the right motor for your particular application.

FOR FREE SLIDE RULE—which lets you determine at a glance the weight and space-saving benefits of recently announced NEMA standards for larger motors—and for informative, free General Electric Tri-Clad '55' motor bulletin, please send attached coupon.

Section 891-6
GENERAL ELECTRIC COMPANY
Schenectady 5, New York

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☐ **FREE BULLETIN** (GEA-6602) describing the many advanced features of new Tri-Clad '55' motors up to 125 hp.

☐ **FREE SLIDE RULE** (GEN-148) to determine weight and space-saving benefits of new Tri-Clad '55' motors.

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Progress Is Our Most Important Product

GENERAL ELECTRIC

Extensive Transfer Lines for Making the Chevrolet TurboGlide

A RECENT issue (see AI, July 1, 1957) provided a detailed introduction to the manufacturing facilities for the Chevrolet TurboGlide transmission which is produced in the new Toledo plant.

The present article is concerned with machining of the one-piece die cast aluminum transmission case; the T-1 turbine shaft (input shaft) which is produced from bar stock; and the T-2 turbine shaft, a unique example of fabrication involving the use of forged tubing and joining with a pressed steel drum.

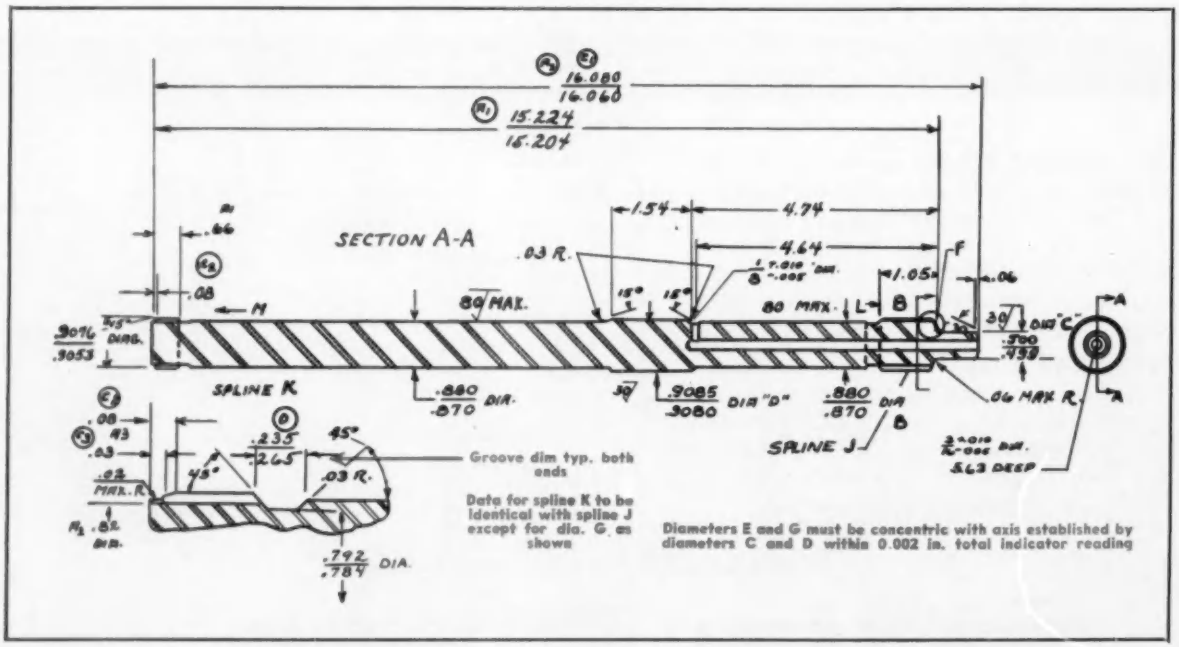
The transmission case and the extension provide the major examples of extensive transfer machine operations since most of the other parts are processed over integrated lines of individual automatic machines. Both transfer machines were supplied by W. F. & John Barnes and are equipped with the now well-known Electro-Graphic Detecto panels which have been found so effective in troubleshooting the intricate electrical circuits.

The W. F. & John Barnes transfer line for the case is a very extensive installation, featuring 37 individual stations with one or more heads at each station, as will be noted later. It is of pallet type with a case fixed in the pallet for the entire sequence. One of its distinctive features is that near the end of the line where final finishing operations —facing and boring—are performed, the machine is split into two similar groups of stations. At this point the pallet conveyor is so arranged as to automatically schedule cases successively to each of the two sections.

This procedure was developed primarily to safeguard production in the event of failure or trouble with either of the two sections. Although one section cannot handle the capacity of the transfer machine, it will at least maintain partial production until the station that may have stopped is brought back into operation.

It is of interest to report that Chevrolet has had notable success with the behavior of this transfer

Here is a drawing of the T-1 shaft, the only one made from bar stock. It shows the long central oil hole and communicating holes, produced in Leland-Gifford drilling machines; and the splines at both ends, produced in the new double-end, horizontal type Fellows gear shapers.



PART II

By Joseph Geschelin

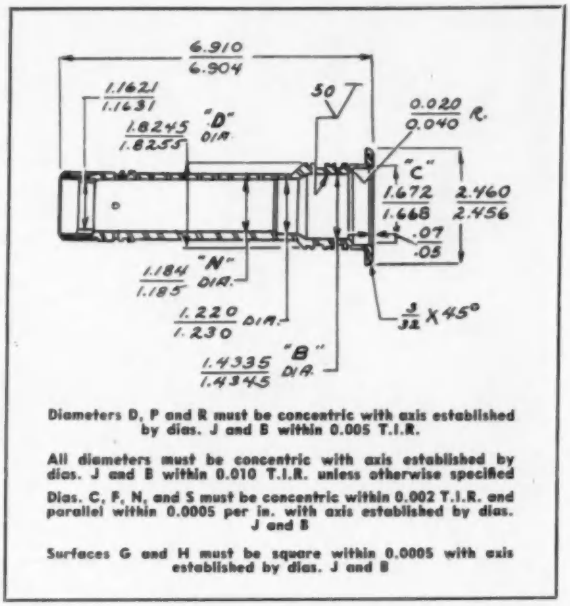
machine. Just as important is the fact that machinability of the aluminum alloy has been far better than anticipated. Not only does it machine readily and cleanly but tool life has exceeded all earlier estimates. One thing worth noting is that although fastening holes are cored in the die casting, all holes are redrilled and reamed to assure size and spacing accuracy.

Because of the extensive character of this equipment, let us summarize briefly some of the major steps in the sequence of events. Before cases are presented to the transfer machine they are put through a five-station, vertical indexing type W. F. & John Barnes machine. This mills four locating pads; drills four holes; chamfers and mills four other holes; reams four holes with an end-cutting reamer fitted with carbide blades; and drills one angular hole. The case now contains the qualifying location points required for positioning in the pallet. From now on the sequence is given below:

Station	Head	Operation
1.		Load and unload
1A		Rough mill 5-deg face
2.	Horiz. LH	Rough face
	Horiz. RH	Angular mill face
3.	Horiz. LH	Finish mill 5-deg face
	Horiz. RH	Rough planetary mill face
4.	Vertical Head	Drill 15 holes
	Horiz. RH	Rough face and chamfer
5.	Vertical Head (ang.)	Drill and chamfer 16 holes
	Horiz. RH	Rough face and chamfer
6.	Vertical angular	Drill and chamfer seven holes
	Horiz. RH	Drill and chamfer nine holes
7.	Horiz. LH	Drill four holes
	Horiz. RH	Drill six holes
	Vertical (ang.)	Chamfer two holes
8.	Vertical (ang.)	Drill one hole
	Horiz. LH	Drill and chamfer five holes
	Horiz. RH	Drill two holes
9.	Vertical (ang.)	Chamfer one hole
	Horiz. LH	Drill five holes
	Horiz. RH	Rough bore and chamfer
10.	Horiz. LH	Chamfer five holes
	Horiz. RH	Finish face and undercut
	Vertical (ang.)	Chamfer one hole
11.	Horiz. LH	Tap four holes
	Vertical (ang.)	Tap four holes
	Vertical (ang.)	Drill two holes
12.	Horiz. LH	Tap five holes
	Vertical (ang.) LH	Tap 14 holes
	Vertical (ang.) RH	Chamfer two holes
13.	Horiz. RH	Tap seven holes
	Horiz. (ang.) RH	Tap two holes

Up to this point the case has been moving sidewise to handle locations on the top face and the ends. At Station 14 the case changes direction of transfer so as to move longitudinally.

15.	Horiz. (ang.) LH	Drill two holes
	Vertical RH	Mill oil cooler pad



Diameters D, P and R must be concentric with axis established by dias. J and B within 0.005 T.I.R.

All diameters must be concentric with axis established by dias. J and B within 0.010 T.I.R. unless otherwise specified

Dias. C, F, N, and S must be concentric within 0.002 T.I.R. and parallel within 0.0005 per in. with axis established by dias. J and B

Surfaces G and H must be square within 0.0005 with axis established by dias. J and B

First example in this study, of shafting made from tubular stock. The T-2 shaft seen here is upset at one end to develop the larger diameter section as well as the flange.

16.	Horiz. (ang.) LH	Drill two holes
	Horiz. (ang.) RH	Drill two holes
	Horiz. RH	Drill three holes
17.	Horiz. LH	Drill two holes
	Horiz. (ang.) RH	Chamfer two holes
	Horiz. RH	Chamfer three holes
18.	Horiz. LH	Spotface one location
	Horiz. RH	Drill one hole
19.	Horiz. LH	Ream one hole
	Vertical (ang.) RH	Drill four holes
20.	Horiz. LH	Chamfer one hole
21.	Horiz. (ang.) LH	Tap three holes
	Horiz. (ang.) RH	Tap six holes

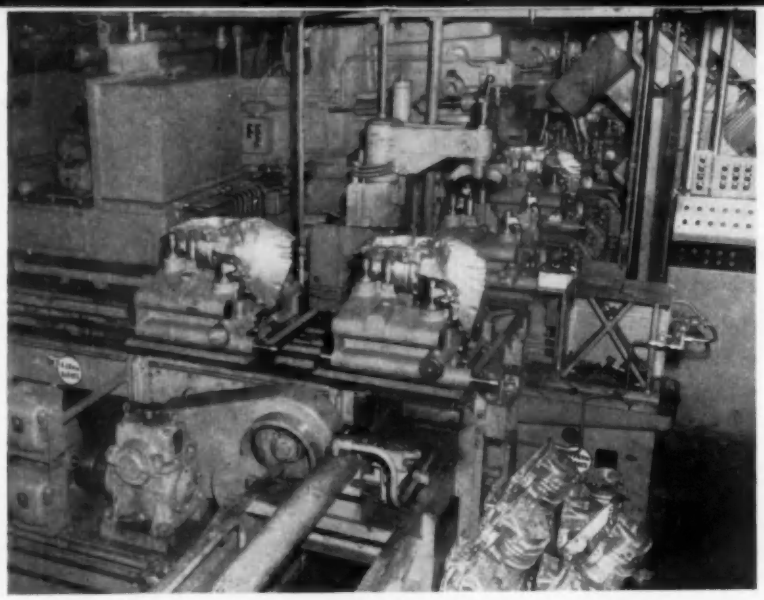
At Station 22 the case again changes direction of transfer, this time to return to sidewise movement.

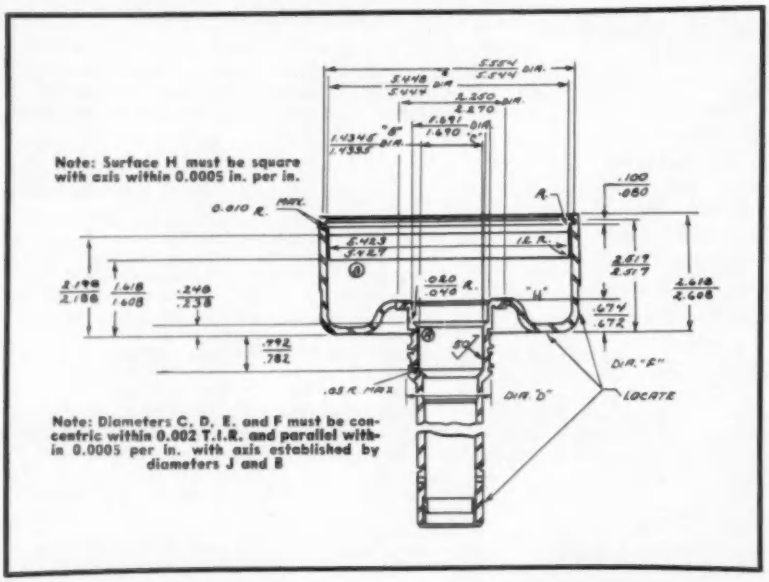
23.	Horiz. LH	Rough face and chamfer at one location
	Vertical (ang.)	Drill two holes
24.	Horiz. LH	Drill and ream two holes
25.		Probe for broken taps
26.		Replace platen if taps broken

At Station 27 the work is scheduled in two directions, as described earlier, to one of two finishing sections.

28.	Horiz. LH	Finish face one end
	Horiz. RH	Finish planetary mill other end
29.	Horiz. LH	Finish bore small diameter
	Horiz. RH	Precision-bore dowel holes
	Horiz. RH	Finish-bore stepped bores in case
30.		Transfer
31.		Transfer on other section
32 and 33		Same as 28 and 29 (on other section)
34.		Pressure test

As we near the end of the machine the work is automatically unclamped and the direction of transfer changed at Station 35 and the work and pallet pass through a flushing station primarily to clean the fixture. At Station 37 the pallet changes direction of transfer once more to present the pallet in proper heading for unloading at Station 1. This then fin-



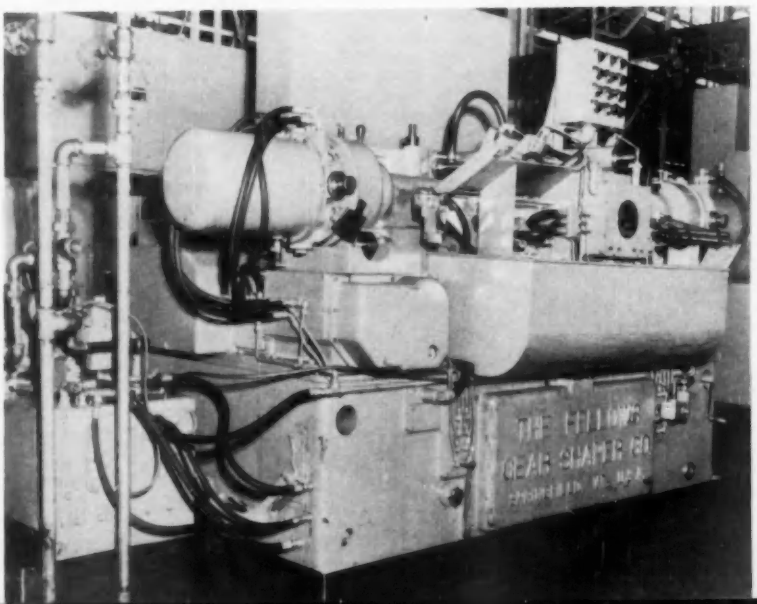

Note: Surface H must be square with axis within 0.0005 in. per in.
Note: Diameters C, D, E, and F must be concentric within 0.002 T.I.R. and parallel within 0.0005 per in. with axis established by diameters J and B
LOCATE
DIA. "D"
DIA. "F"

ishes the sequence of operations and completes the conveyor loop around the entire machine line.

Having now ended this lengthy tour around the case line, it is of interest to recapitulate some of the machine data. As mentioned earlier, the case line has 37 individual stations. On the other hand it bristles with an arrangement of 61 individual heads, without counting idle or indexing stations. Counting individual operations, we come up with this total: drilling 92 holes; reaming three holes; tapping 45 holes; chamfering 49 holes; boring 8 holes; facing at 6 locations; milling at 6 locations; spotfacing at 1 location. These figures do not include the preparatory operations in the first five-station machine.

Let us now consider several of the turbine shafts. The first example is that of the T-1 shaft, the only one made from bar stock, as illustrated. T-1 Shafts are turned from bar stock in a battery of Cone 4-HI automatics—turning, grooving, chamfering, and cut-off. The long central oil hole, as well as connecting oil holes, are drilled in special Leland-Gifford drilling machines. Shafts go to heat treat for refining grain structure at a temperature of 1525-1575 F, then are quenched, and tempered to R_c 28-32.

After straightening, the shafts are put through a group of Cincinnati No. 3 Centerless grinders for rough-grinding the contour,



Top—One corner of the big W. F. & John Barnes transfer machine for the transmission case. The close-up shows the manner of mounting the case on the pallet.

Middle—The T-2 shaft after joining with the pressed steel ring gear hub. Submerged-arc welding is performed after the shaft has been completely machined.

Bottom—A Chevrolet "first": the new horizontal type, double-end Fellows gear shaper for producing splines on both ends of the T-1 shaft. The magazine feed for loading may be seen at the upper center of the machine.

then finish-grinding of five diameters in another group of centerless grinders.

What appears to be a Chevrolet "first," at least in the writer's experience, is the adoption of Fellows Double-End horizontal gear shapers for shaping the splines at both ends of the shaft. Splines are chamfered in Burrmaster BME-24, two-station duplex machines. Final operation is finish-grinding the pilot and face in a Cincinnati No. 2 chucking grinder.

Involute spline data for this shaft are as follows: 16 splines; diametral pitch 18.83239; pressure angle—20 deg. Maximum cumulative pitch error permitted for any two teeth is 0.0005 in. Maximum permissible involute profile error—0.0005 in.

Incidentally, the Fellows machines are provided with magazine feed and automatic unloading.

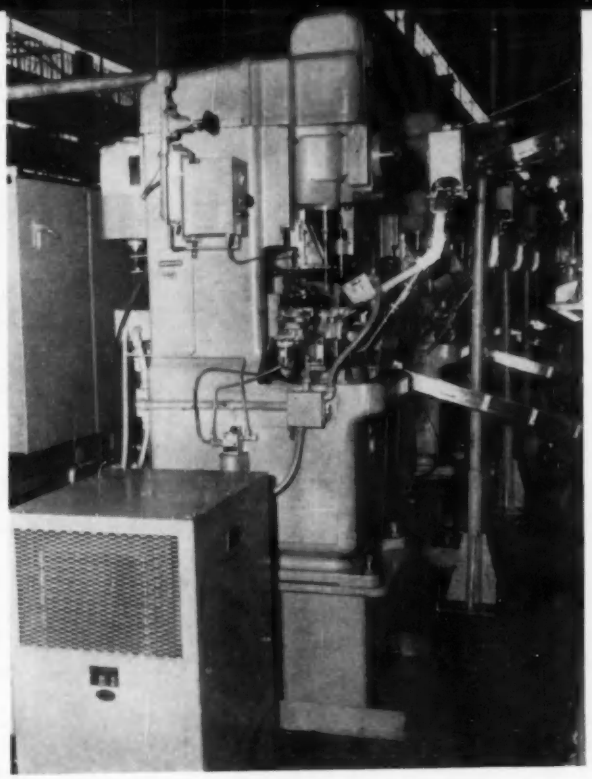
The second example is the T-2 turbine shaft which starts as cold drawn seamless steel tubing of AISI C-1041 in multiples of 9¼-in. Tubing is 1.526 in. OD x 1.162-in. ID. The tube is first upset at one end as illustrated, then the ID is broached to size in an American PD-5-15-54 vertical broaching machine. All OD's, grooves, rear face of flange, face of small end are finished from the rough in a New Britain GF tracer-controlled lathe, using a single-point tool. Turning of flange OD, facing, chamfering, drilling and reaming of the ID is done in a New Britain Model 86 chucker.

Boring of the counterbore in one end is done in a two-spindle Olaffson precision boring machine.

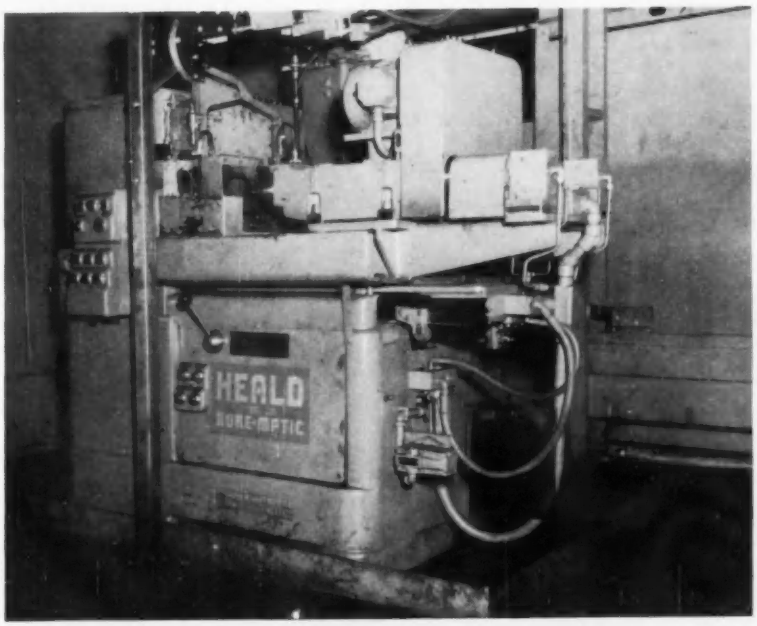
A bushing is pressed into the counterbored small end and bored in an Ex-Cell-O Model 2112 precision boring machine. This end is splined by hobbing in Model 8810 Cleveland hobbers. Burrmaster machines are used for chamfering the splined end. Final major operation is that of grinding the spline OD, groove OD's, and rear face of flange in a Cincinnati 10 x 18 in. 30-deg slide grinder.

Unique feature of the T-2 shaft is that it is of composite design. After the shaft section has been processed, it is welded to a previously prepared pressed steel drum, as illustrated. This is a carefully controlled seam-welding operation performed in a special Expert welder fitted with a Lincolnweld submerged-arc head.

(*Turn to page* 112, *please*)



Looking down the line of Micromatic honing machines for honing the bores of planet pinions, described in Part 1. The system of chutes at the top is used for feeding the work stations, the lower chutes for transporting parts to the next operation.



Close-up of one of the Heald Model 221 Bore-Matic machines for precision-boring of planet pinion bores, as described in Part 1. These are two-spindle machines, the distribution of pinions to each spindle being effected by means of the special magazine which may be seen above the rear head of the machine.

Autocycling Process for Surface Treatment of Aluminum

By C. J. Riddle
Supervisor of Plant Engineering
B-6 Douglas El Segundo Division

A REVOLUTIONARY approach to the surface treatment of aluminum aircraft components processes several times the number of parts handled by comparable methods. By using only two tanks in this Alodine-Anodizing system instead of the 10 or more used in conventional methods it requires only one-third of the floor space and was built for less than one-fourth of the cost.

Furthermore, instead of using over 4000 gal of solution in each tank of a 10-tank system, less than 100 gal for each operation are used at the B-6 Torrance location of Douglas El Segundo Division.

Accelerated schedules for Navy planes at the parent plant made it impossible for them to continue anodizing for the Torrance location.

Plant Engineering at B-6 was asked for a solution.

The following steps are required for chemical surface treatment (Alodine, Iridite and / or Anodic treatment):

Step 1. Hot water bath — for bringing parts being processed from ambient temperature to the temperature of the alkaline cleaner used in Step 2 so that cleaner solution will retain heat.

Step 2. Hot alkaline cleaner—for cleaning parts.

Step 3. Hot rinse—for removing alkaline cleaner solution adhering to the parts.

Step 4. Chemical bath—for applying surface treatment (Alodine, Iridite, etc.)

Step 4A. Anodic electrolysis treatment—for anodizing parts.

Step 5. Hot rinse—for removing traces of chemicals adhering to the parts.

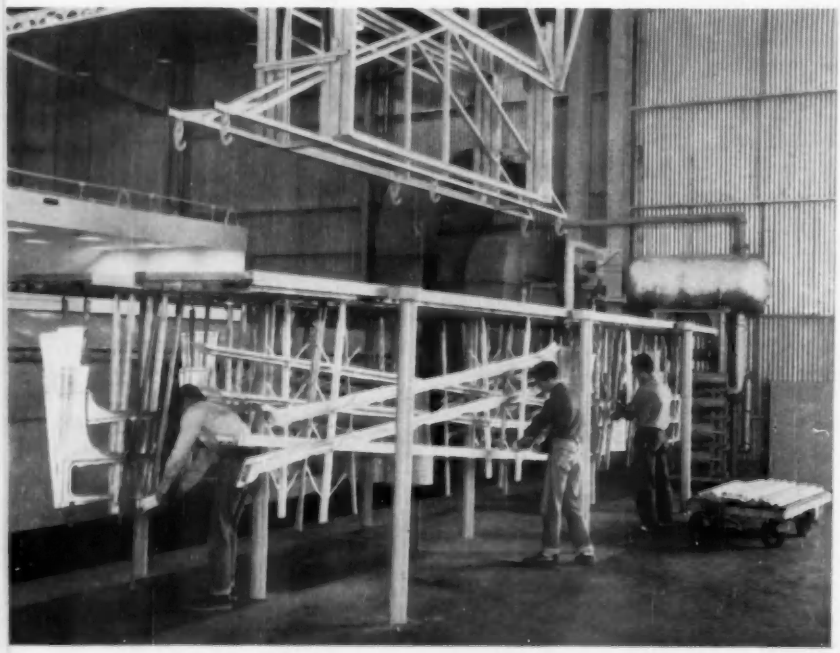
Step 6. Hot acid rinse—for promoting paint adhesion (Alodine, Iridite treatment).

Step 6A. Hot Anodic seal—for anodized parts.

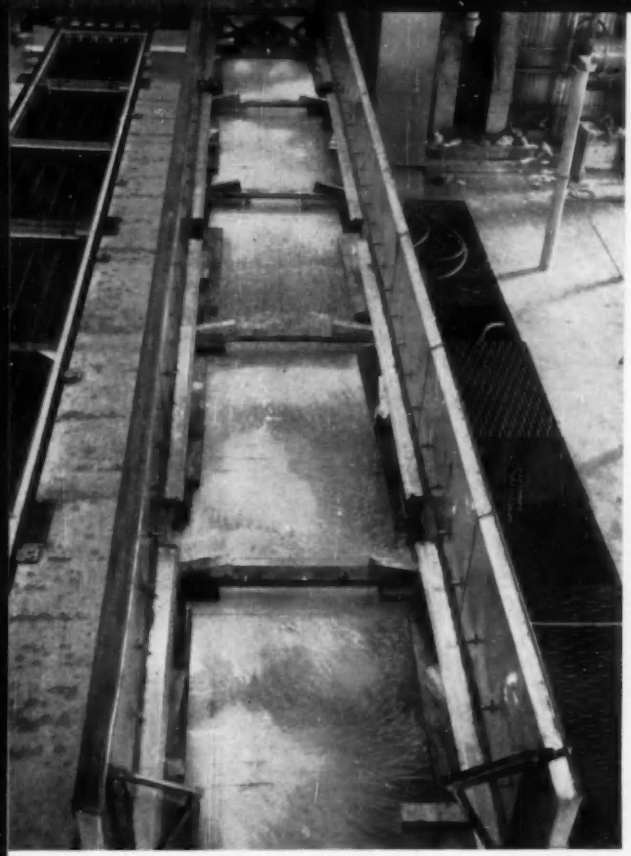
Step 7. Hot circulating dry-off—for drying parts.

Typical operation of the conventional method leads the parts in carrying baskets and an operator, using an overhead crane, lowers the parts into each of the tanks successively. As the dwell within each tank is relatively short, the operator stands by the crane as the cycle progresses. In other words, the parts are taken to each step of the processing accompanied by an escort.

Parts are not handled that way in the new Torrance system. At Torrance they are securely fastened to carrying fixtures and lowered into the first of two tanks and the lid of the tank is closed. By pressing a button for anodic processing the automatic cycling is started and the steps previously done in the first three tanks of conventional systems begin. One follows the



The loading area for the anodic-alodine system. Parts are hung on holding fixtures and secured firmly.



Looking down on the cycling tank. Ordinarily the lids would be closed. Note the swirling of the solution. This solution will spray every plane of the parts when the lids are down and full power is on the impellers.

other automatically without the lid being opened.

At the completion of these steps the automatic cycling mechanism stops operation and the batch to be anodized is removed and placed into the adjoining anodizing tank where standard anodizing follows. While this anodizing progresses, a new load is introduced into the cycling tank for Alodine processing. This Alodine cycling is all done in the first tank and is completed before the anodized load is ready to proceed.

When the time required for the batch to remain in the anodizing tank has elapsed it is removed and placed in the original cycling tank and the hot rinse, anodic seal and drying phase follows.

There is no down-time in this B-6 setup. While a load is automatically going through the cycles it is unattended. The operator, instead of hovering over the steaming tanks with the crane, is loading the carrying fixture with the next batch in line. As quickly as one batch is finished the next is ready and a new cycle is begun.

The cycling tank was designed and built at the B-6 location. Instead of having the expected flat base its bottom is a series of scallops. At the deep part of each scallop and running across the tank are shafts on which are keyed agitators of an impeller type.

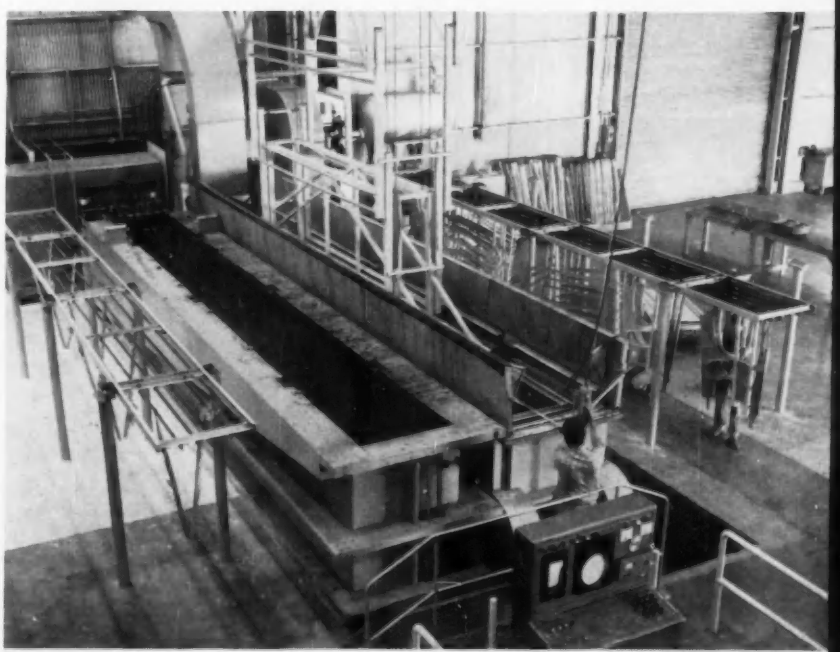
The solutions for the various steps in the processing are dumped into the cycling tank to the top of the scallop line. The agitators are energized to 1750 rpm and the parts are showered with the solutions in the tank. Every surface of the parts in the tank is in firm contact with the solution.

Speed in handling the operations was paramount so every part provides for speed. The solution lines into the tank, for instance, have six-inch valves. There is no time wasted on either fill or dump.

All water-based solutions go through an instantaneous shell and tube water heater. This installation eliminates hot water storage tanks. Up to 120 gpm are heated to temperature with this system.

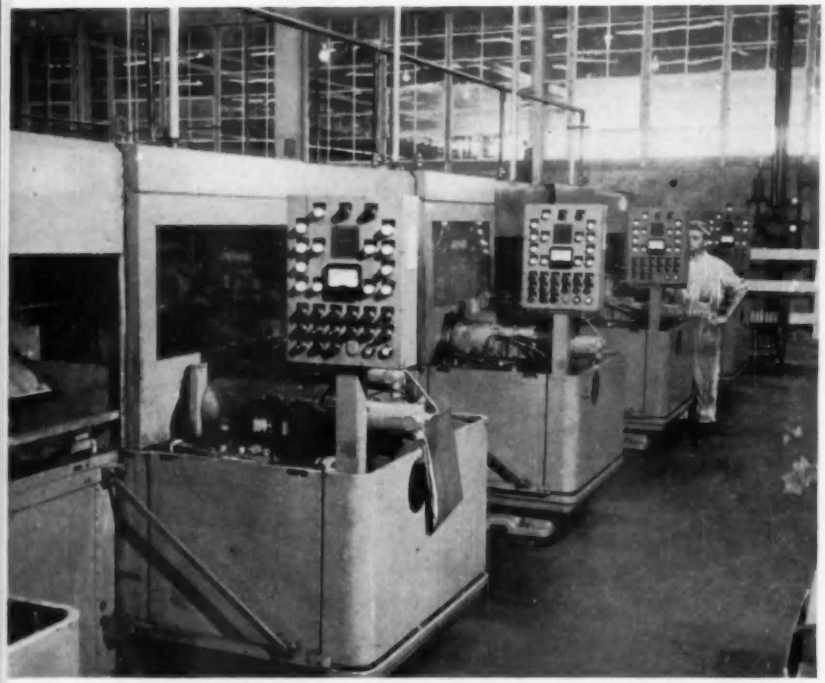
An alkaline solution is made by introducing measured amounts of alkaline cleaner concentrate as the hot water enters the tank. The so-

(*Turn to page* 102, *please*)

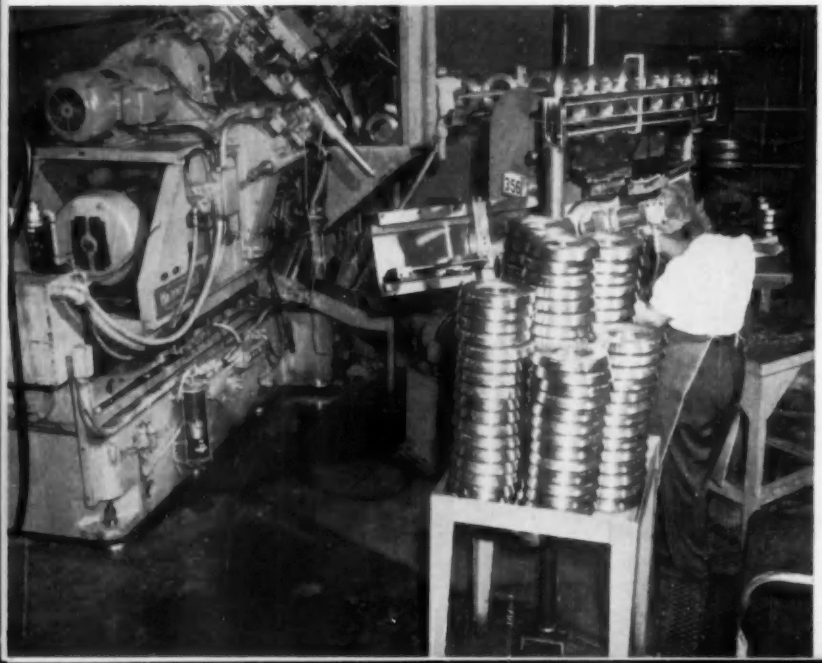


Parts are being lowered into cycler tank on right. When they are located the lids lower and cycling begins at console in right foreground. Process at work in tank is indicated on console.

Special Machines at Ford Sterling Chassis Parts Plant



Multi-station turning lines process pinion gears. These special Fay automatic lathes turn the forgings to an accuracy of 0.005 in.



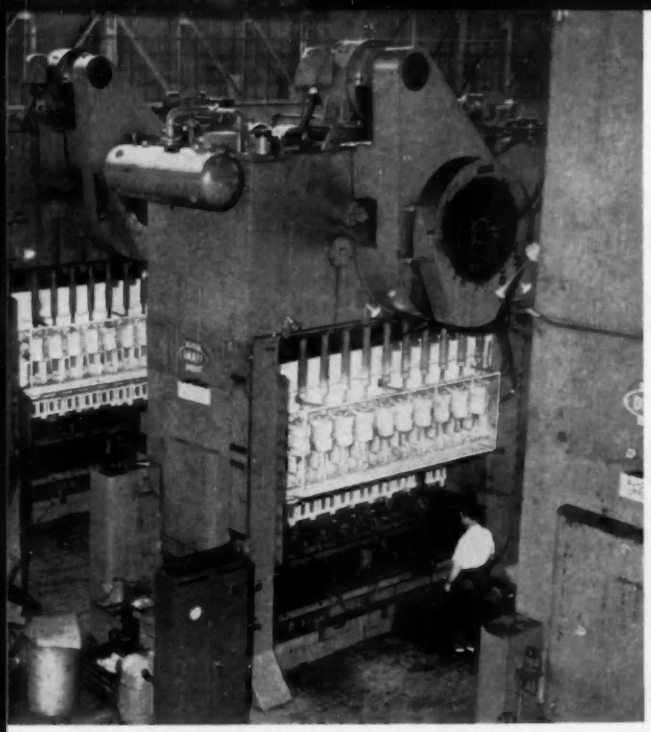
SUPPLEMENTING the recent article (see AI, June 15) describing some highlights of the new Ford Sterling chassis parts plant is this pictorial layout showing some additional items of noteworthy equipment.

Perhaps one of the most interesting of the "firsts" on the machine line is the battery of five special Fay automatic lathes illustrated here. Each group of five machines is tied together by unique automation to give the effect of a single automatic machine. Rear axle pinion gear forgings, in the rough, come in at one end and leave the group completely turned overall and centered.

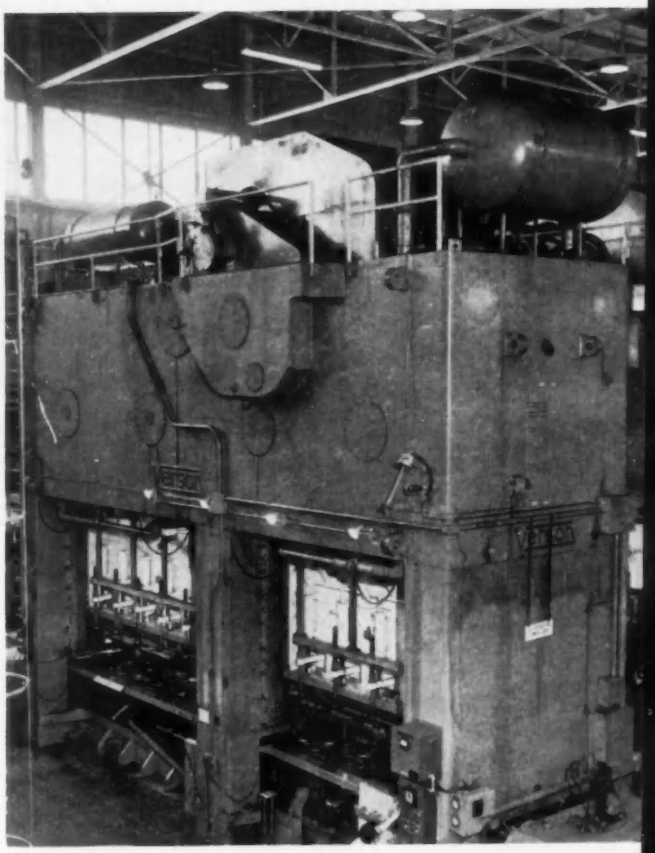
One of the most striking sights in this plant is the group of 10 transfer type presses, some with rated capacity up to 2200 tons. Examples of Verson and Danly presses are illustrated.

Barnes Drill Co. has developed some noteworthy special machines for this plant. The drilling and tapping unit for ring gears is a good example. Completely automatic in action, the machine has automatic loading and unloading.

Automatic loading and unloading has been incorporated on four special Barnesdril machines which drill and tap 10 "blind" holes in ring gears.

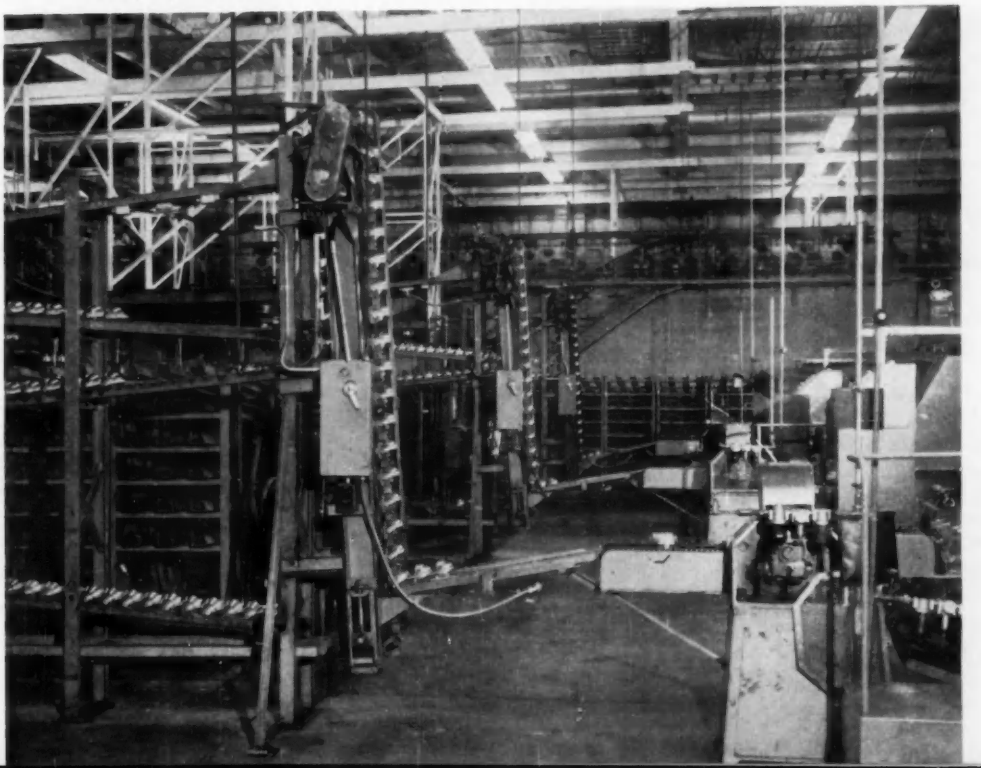


Huge presses in which progressive dies perform several successive stamping operations are among the examples of modern production equipment used at the plant. Two Danly presses which form front suspension parts are shown here.



A huge 10-station Verson transfer press with a forming capacity of 2200 tons stamps front suspension arms.

Serial numbers are stamped on pinion gears by the machine shown at right as the parts leave a series of Fay automatic turning lathes. The gears then are indexed into gravity "banking" chutes at the left before moving to succeeding operations.



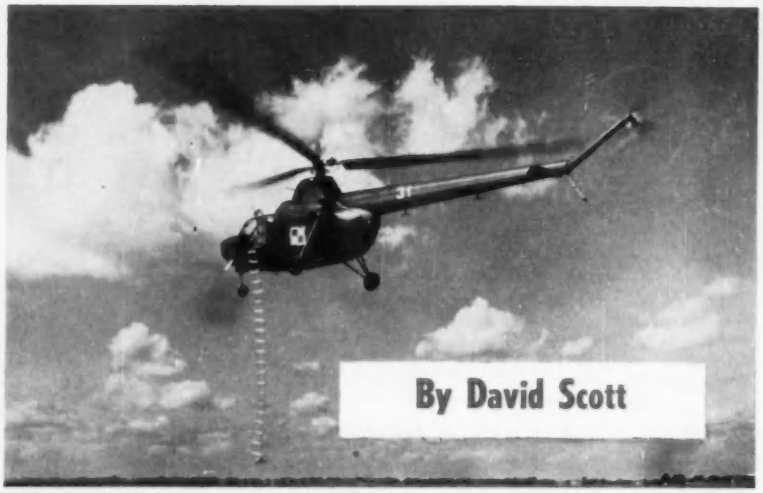
Outlook for Polish Motor Industry Revealed at Poznan Fair

By David Scott

THE Poznan Fair in June was more significant for the probing of the Polish market by a large number of western vehicle manufacturers than for new models shown there. The record non-Communist participation was prompted by the relaxing of the political atmosphere in Poland and by the wave of foreign credits that have followed. These include $95 million from the United States, $28 million from France, and $5 million from Austria. British banks are understood to be considering the figure of $140 million, while the West German Government broke the diplomatic ice by sending an official mission to Warsaw during the Fair to talk credits and trade.

European car firms with exhibits at Poznan included Standard, Ford (Dagenham), Austin, Rootes, Simca, Citroen, Renault, Peugeot, Mercedes-Benz, Ford (Cologne), B.M.W., Lloyd, and Fiat. Among makers of trucks and buses were Leyland, A.C.V., Commer, Chaussons, Berliet, Bussing, Tempo, and Saurer. Diesel engines were displayed by F. Perkins, Rolls-Royce, Brush, A.B.E. and Deutz, while British Ford, David Brown, Massey-Harris-Ferguson, Vickers-Armstrong and a number of German makers presented tractors.

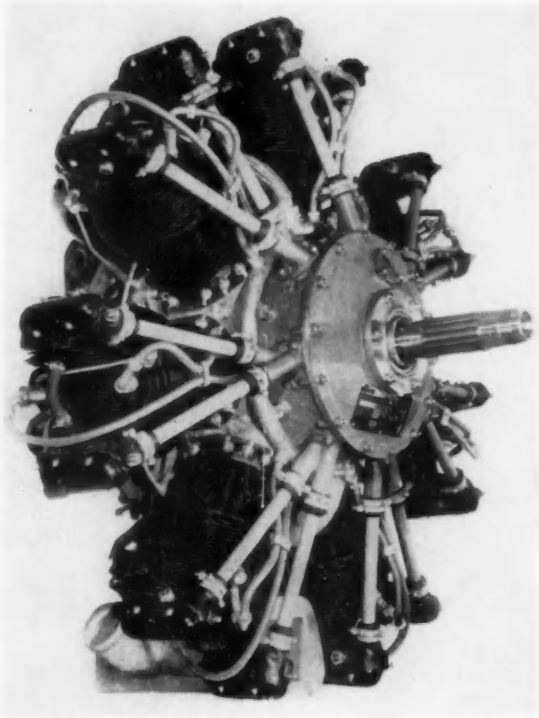
America made its first-ever appearance at a Communist trade fair with a large prestige exhibition staged by the U. S. Department of Commerce. Cars on display were a Lincoln Capri, Chrysler Saratoga, Ford Fairlane 500, Plymouth Savoy and Rambler Custom. Shown separately at a demonstration area on the edge of Poznan were tractors by International Harvester, Ford and Oliver.



SM-1 helicopter, offered for export by Poland, has a 575-hp radial engine.

Improvement of road transport and mechanization of farming are two of the priority jobs set for the immediate future by the Polish Government to put some order into the country's mismanaged economy. At present there are only 43,000 cars and 84,000 trucks in a territory the size of Michigan and Illinois and with a population of 27 million. Substantial automotive imports are en-

Half-ton pick-up version of the Warszawa car is the first light truck to be made in Poland. Its side-valve engine develops 54 hp.



Polish seven-cylinder radial engine has a take-off rating of 315 hp at 2350 rpm. It powers the Bies TS-8 trainer and Zuk BZ-4 helicopter.

visaged as are licensing agreements for local manufacture.

Among proposals already received are those for truck engines and passenger cars from French and Italian firms, for German and British tractors, and for German marine Diesel engines. On June 1 Poland and Czechoslovakia signed an agreement covering technical cooperation between their two motor industries, although few details of this have been released. Until now, Poland has used mainly Russian designs for its vehicles.

The only car mass-produced in Poland today is the Warszawa based on the Soviet Pobieda. Planned output for this year is 10,200 units, rising to 30,000 in 1960. By that time the Russian-equipped Zeran factory (A. I. 15 August 1956) is presumably scheduled to reach its full capacity of 25,000, and the remaining 5000 will be accounted for by the small Syrena, to be introduced in its final form next year.

Beyond that, car production for 1965 is fixed at 87,000, and for 1970 at 122,000. These relatively large increases suggest the construction of new factories, and possibly the manufacture or at least assembly of foreign models. A similar deduction might be drawn from the figures for trucks. Annual output, which in 1955 was 9910, is expected to rise to 19,000 in 1960, 42,500 in 1965, and 53,000 in 1970.

At the Poznan Fair Poland exhibited a new half-ton pick-up version of the Warszawa car, the first light truck to be made in that country. It is of integral body-frame construction, and has a heavy-duty suspension system and high ground clearance appropriate for bad rural roads. The four-cylinder, side-valve engine of 129 cu in. has been modified with a 7 to 1 compression ratio and other improvements to increase output to 54 hp at 3650 rpm.

The one Polish-designed truck, now designated Star 21, has been up-rated to a load capacity of four tons by heavier springing and a somewhat larger body. Of cab-over-engine construction, it has a six-cylinder overhead valve gasoline unit developing 85 hp at 2800 rpm. A five-speed gearbox is now fitted, the top ratio being an overdrive. It is understood that the manufacturer is considering importing a British Diesel engine for this model.

Poland also has an eight-ton truck under development that will be powered by a new six-cylinder Diesel rated at 150 hp at 2200 rpm, with a displacement of 604 cu in. and 19 to 1 compression ratio. The two-axle A-80 is 290 in. long and 150 in. high.

In the field of aircraft, Poland is preparing a new medium-sized helicopter with a carrying capacity of three passengers or 1000 lb

(*Turn to page* 111, *please*)

Hungarian tracklayer which is powered by a 125-hp Diesel engine

The Aerobilt Semi-Trailer

Extensive Use of Aluminum Has Resulted in a 35 Ft Long, 2180 Cu Ft Trailer Which Weighs Only 8100 Lb

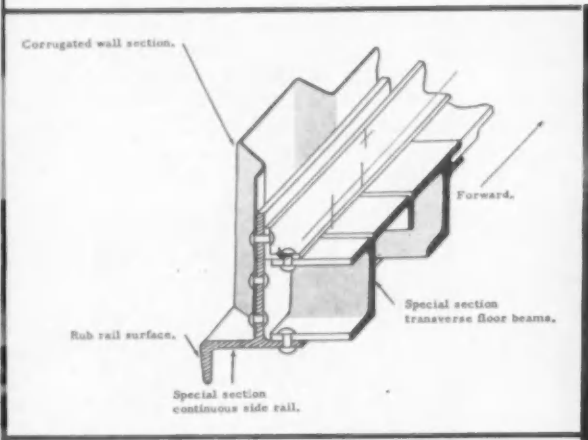


FIG. 1—The junction of the sidewall and floor is shown in this construction cutaway.

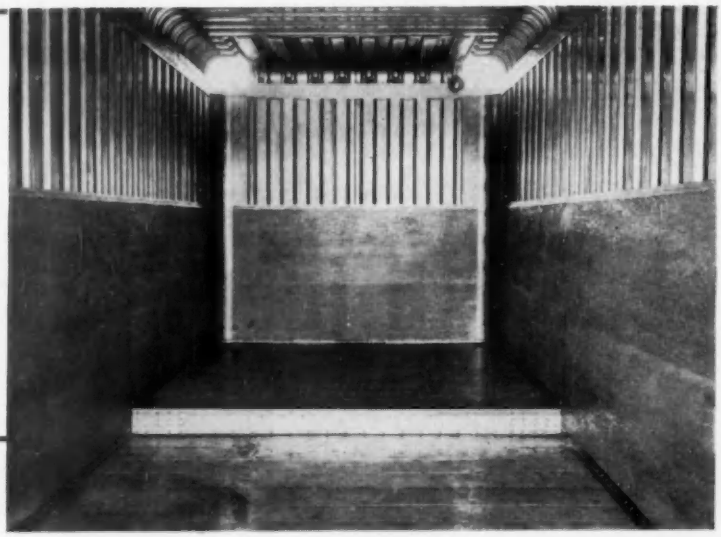


FIG. 2—View of the forward interior section of the "stepped" version of the trailer. Plywood lining and fibreglas corner skylights are shown.

THE Aerobuilt trailer achieves substantial improvements in weight reduction, maintenance, simplification, tire life, and safety through the application of aircraft aluminum fabrication techniques and the adoption of a suspension system which is new to commercial trailers. Grumman Aircraft Engineering Corp. designed the trailer which is being manufactured by its subsidiary, Aerobilt Bodies Inc. of Athens, N. Y.

The trailer box is constructed entirely of aluminum. The only components of the trailer which make use of steel are the landing gear, the fifth wheel pickup, and the suspension system. This extensive use of aluminum has resulted in a 35-ft long, 2180 cu ft trailer which weighs only 8100 lb including the steel disk wheels and 10.00 x 20 tires.

Weight saving has been achieved without sacrifice of strength and structural rigidity by adopting the monocoque technique of construction which is common to aircraft. In this system the walls, roof, and floor of the trailer are the structure rather than merely coverings fastened to a frame.

This monocoque trailer box is mounted on a deep section beam backbone. The backbone consists of a channel section (1¾ by 6 in.) aluminum beam running from the transverse landing gear beam to the rear bumper. In the area of the tandem two of these channel sections are combined to form an I-beam and are supplemented by additional beams which are placed outboard on both sides.

The floor consists of special section aluminum alloy "planks" (see Fig. 1) which are laid transversely. The planks are riveted to the longitudinal beams and to the special section aluminum side beams which run the full length of the trailer body. These side beams also serve as rub rails. The floor planks are each 2¾ in. deep and 8⅔ in. wide. A tongue and groove joint connects adjoining sections.

This transverse flooring, which is a unique feature of the trailer, eliminates the cross sills common to all conventional trailer designs. Butt joints also are eliminated and the floor seams run crosswise to the direction of travel. If desired, wooden special section beams may be substituted at intervals to provide for nailing area requirements.

In the area over the tandem the floor planks are

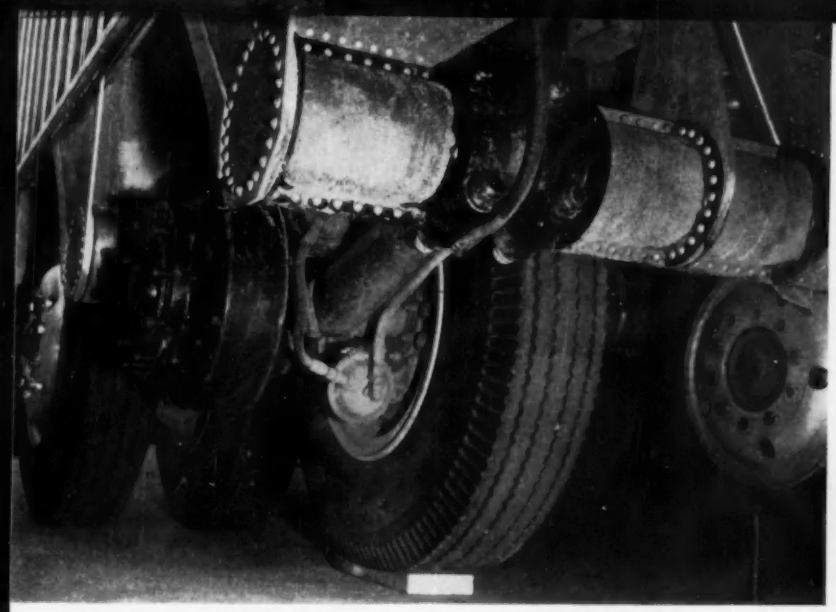


FIG. 3—Trailing link suspension. The inner wheel of a pair has been rolled onto a block and the outer wheel removed.

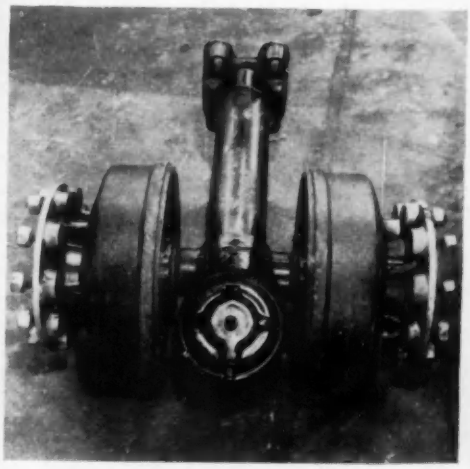


FIG. 4—Trailing arm assembly. The forward end is clamped to the Torsilastic spring and one wheel is mounted on each drum.

replaced by a ¼ in. thick aluminum sheet (and the additional longitudinal beams) in order to allow a maximum of clearance for wheel travel. The ultimate strength of the floor in all areas is 1000 lb per sq ft.

The sidewalls and roof of the trailer are of the same material and cross section. The 0.064 61S-T6 sheets are rolled to a corrugated cross section with the corrugations being 4⅓ in. wide, 1¼ in. deep and 8⅔ in. on centers. Each sidewall and roof section is 34⅔ in. wide. The roof panels are bent down at each side and are riveted to longitudinal aluminum members and the side panels (see Fig. 2). Intermediate corrugations at the bends at the edges of the roof increase the rigidity of these sections. Additional stiffness is provided by flanging the edges of each panel and connecting adjacent panels by riveting the flanges together. The upper edges of the body are protected by external cove plates which run the full length of the trailer.

The double rear doors of the trailer are hung on slotted hinges and are of sandwich construction. The inner and outer surfaces of the door are sheet aluminum (0.051 inner, 0.064 outer). The inner part of the sandwich is a honeycomb core of aluminum foil making a total door thickness of only one inch.

The trailer is manufactured in both straight floor and "stepped" versions. In order to attain maximum volume in the straight floor version, and minimum step height in the stepped versions the fifth wheel pickup plate structure has been reduced to a thickness of only five inches. This thinness has been achieved without excessive weight through the use of box section transverse aluminum beams, a special extrusion of 6062-T6 aluminum alloy with a thick walled corrugated cross section, and a ⅛ in. steel bearing plate. The extrusion, with corrugations ⅞ in. on center and running fore and aft, is placed between the steel bearing plate and the aluminum beams and serves to distribute the load. The steel

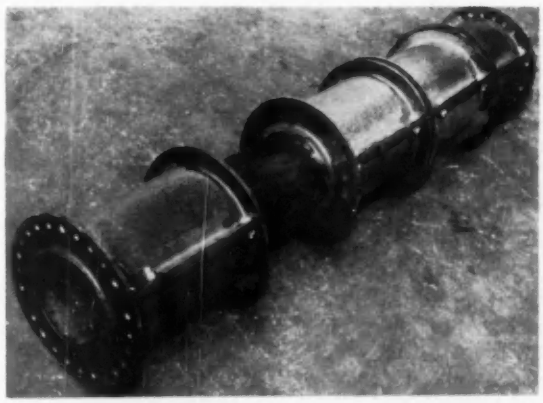


FIG. 5—Torsilastic spring assembly. The trailing arm is clamped to the continuous steel inner tube which is visible between the first and second sections. The second and third sections are the secondary spring units. The arm going to the load distributing linkage system will be mounted in the space shown between these two sections. The fourth, like the first, is a primary unit which is fastened to the chassis.

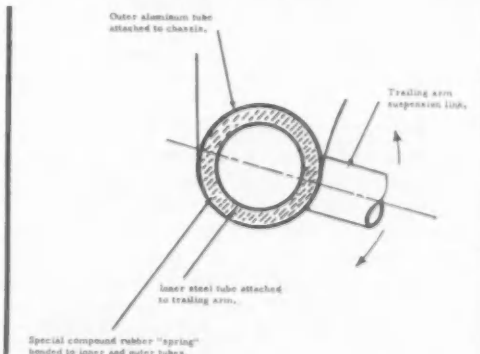

Outer aluminum tube attached to chassis.
Trailing arm suspension link.
Inner steel tube attached to trailing arm.
Special compound rubber "spring" bonded to inner and outer tubes.

FIG. 6—Torsilastic unit cross-section. The wheel travel rotates the trailing arm and inner steel tube. The rubber filler section in torsion provides the resistance and load absorption.

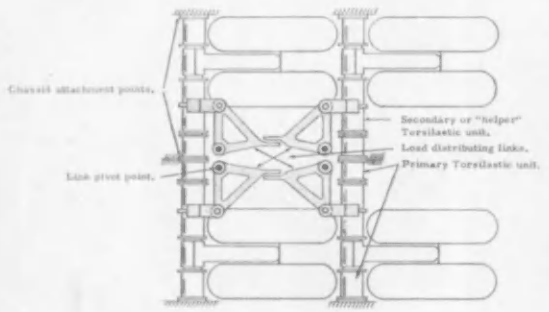


FIG. 7 — Plan view of tandem layout. The load distributing linkage system is shown schematically.

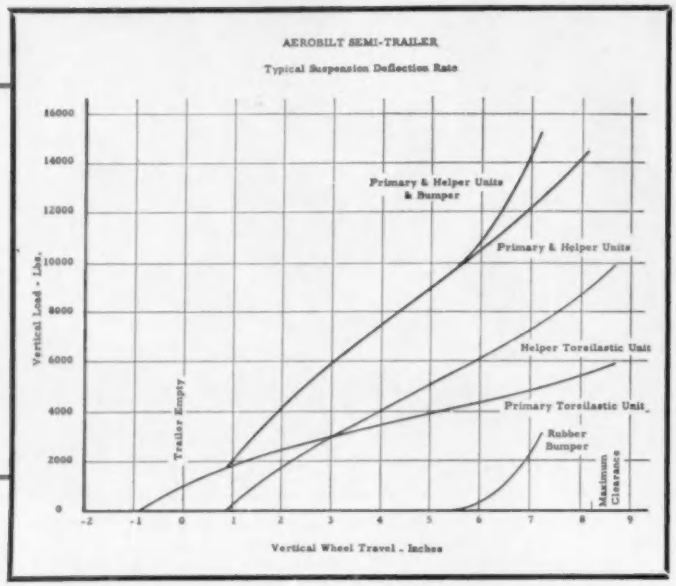


FIG. 8—Suspension deflection rate. The spring rate shown is for a typical installation and applies to one trailing arm (one pair of wheels.)

kingpin assembly is fastened to one of the transverse beams and the extrusion and steel plate through which it extends. On the inside of the trailer an aluminum plate 3/16 in. thick is installed over the transverse aluminum beams.

The suspension system of the Aerobilt trailer is unique in that each pair of wheels is sprung independently and each wheel rotates individually. There are no conventional axles.

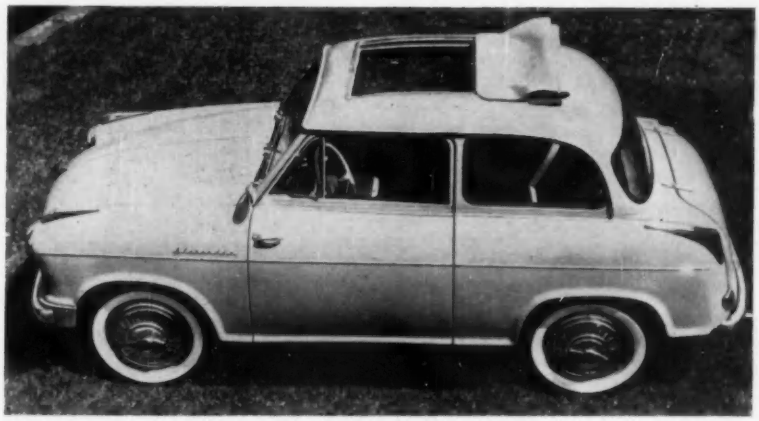
The basic item of the suspension system is the trailing arm of which there are four in the eight-wheel tandem arrangement. The trailing arm for the forward, right hand side is shown in Fig. 3 with the outer wheel removed for clarity.

These trailing arm links are constructed of steel tubes five inches in diameter with walls ⅜ in. thick. The forward end of the arm is fitted with a forged yoke and clamp configuration and is clamped to the Torsilastic spring unit. At the aft end of each trailing arm two spindle and brake assemblies are fitted. One wheel mounts on each spindle and brake assembly. An unmounted trailing arm assembly and Torsilastic spring unit are shown in Figs. 4 and 5 respectively.

The Torsilastic "spring" unit is the actual load carrying and shock absorbing medium and makes use of rubber in torsion. These units basically consist of two concentric metal cylinders with a filler of rubber between them as shown in Fig. 6. The filler of special compound rubber is 11/16 in. thick and is bonded to the steel inner cylinder and the aluminum alloy outer cylinder. The forward end of the trailing arm is clamped to the inner cylinder of the unit. The outer cylinder consists of four separate sections. Two of these are primary sections which are fastened to the structure, which provides the reaction. The two others comprise the helper spring section which comes into effect at approximately 20 per cent of the maximum allowable axle load. The reaction for the helper spring is created through a linkage system (see Fig. 7) which connects the fore and aft pair of wheels on each side of the tandem. This linkage also serves as a means of equalizing the load distribution. Wheel deflection vs. load is shown in Fig. 8. The Torsilastic unit is a development of The B. F. Goodrich Co. and in previous applications has been shown to be maintenance free and virtually indestructible.

The structural stresses in the trailer body and the degree of jarring to which the cargo is subjected are thereby reduced. Additionally the trailing arm suspension acts to create increased wheel adhesion during braking and reduces skidding during application when turning.

Since each wheel of trailer is mounted on its own spindle it is free to choose its own speed of rotation. This individual rotation precludes the possibility of one wheel driving another at a faster speed than is required and substantially reduces tire wear due to scuffing on curves, crowned roads and in maneuvering. This individual mounting also permits the use of individual brakes, each 16½ by 4 by ¾ in. Wheel removal is facilitated since one wheel of the pair may be rolled up on a block (see Fig. 3) leaving the other wheel unloaded and clear of the ground.



The new Lloyd Alexander

Lloyd 600 for 1958

New Model of Lightweight, Front-Drive Car Brought Out in Germany

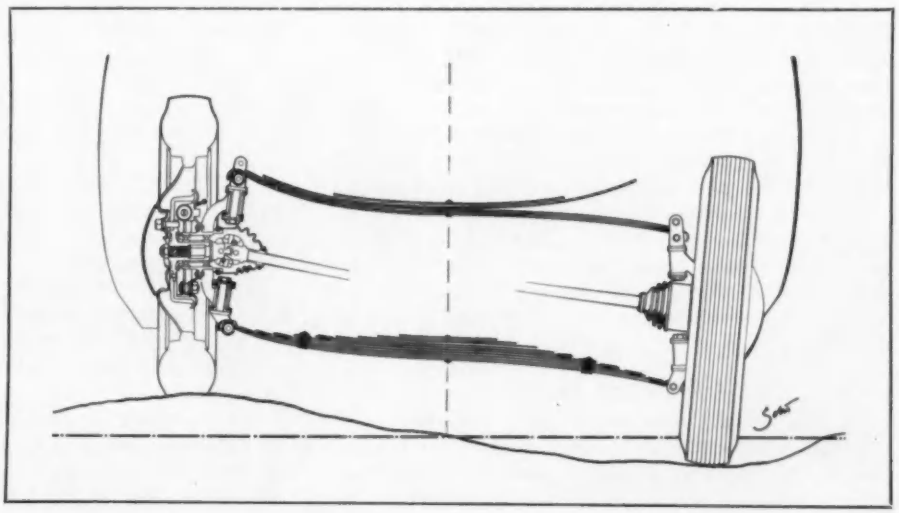
WITH its new entirely synchronized four speed transmission, modified springing and body improvements the Lloyd 600 for 1958, which bears the name of "Alexander," is representative of present trends in European small vehicles.

The Lloyd 600, which is produced in Germany by the small car division of the Borgward Group (an independently conducted firm like the Goliath and Borgward divisions), follows closely the results of an extensive market research program carried out by its makers.

Instead of the former three-speed transmission a new four-speed version is now available as an optional extra. This has two very compact synchronizing units for the two upper and the two lower speeds respectively.

Springing is now softer, and two shorter leaves have been added to provide a variable rate suspension. Although the rear wheels are suspended on swinging half axles—it will be remembered that the Lloyd has front wheel drive—semi-elliptic springs are used. These have rubber inserts for low self-damping characteristics, and both the spring connection with the body and the member for brake thrust take-up use rubber blocks.

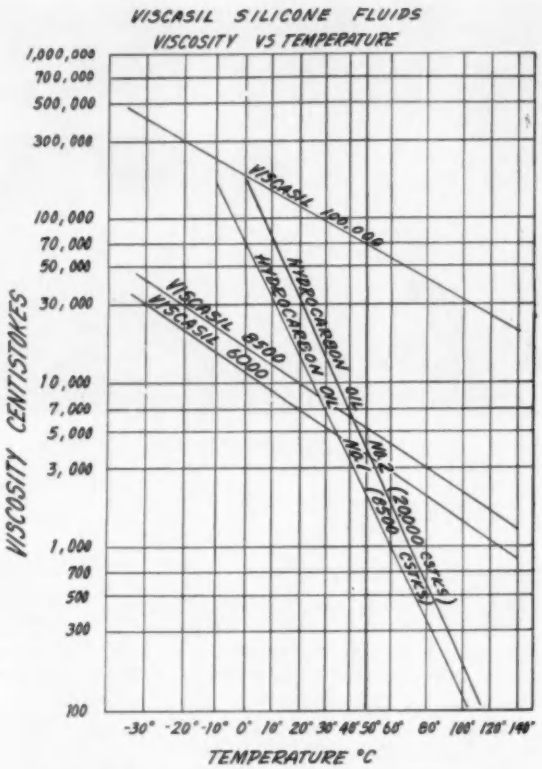
The aircooled two cylinder, four stroke engine is mounted at an angle at the front end of the vehicle. Features are an overhead camshaft and inclined valves in a hemispherical combustion chamber. Specifications of the engine are: bore 3.03 in.; stroke 2.52 in.; piston displacement 36.6 cu in.; max bhp 19 (net) at 4500 rpm; max torque 28.2 ft lb (net) at 2500 rpm. With a wheelbase of 79 in., weight of the two door four passenger sedan is 1246 lb.



Flexible transverse leaf springs are supplemented by full load auxiliary leaves in top spring for driven front wheels

Improving Automotive Products with SILICONES

By Paul A. Goodwin
Manager—Technical Service
Silicone Products Dept.
GENERAL ELECTRIC CO.



Temperature changes have less effect on the viscosity of silicone fluids than on any other known fluids. Graph shows the viscosity-temperature relationships of typical silicone and petroleum fluids.

IT has been said that more uses were found for silicones in a shorter time than for any other material ever made by man. And while this statement was not made with the automotive industries specifically in mind, the wide variety of silicone applications in the industry illustrates the point very well.

In one form or another, silicones are used by the manufacturers of vehicles and accessories, by the manufacturers of materials for automobiles and accessories, by maintenance and repair shops, and by car owners themselves. None of the types or properties of silicones have been overlooked in the search for better products or production methods.

In these various applications, the silicones may be fabricated into actual parts, such as rubber seals or boots; they may be used as processing aids, as in the case of mold release or anti-foam; they may be incorporated as parts of accessory units, as in the case of the power-take-off fan; or as additives or ingredients, as in polishes, paints, and antifreeze.

The list of uses for silicones has grown continuously since the automotive industries first became interested in them during World War II. Recent design trends plus improvements in the versatile synthetics themselves have accented this interest and their use should continue to grow, perhaps even more rapidly than in the past.

THE NATURE OF SILICONES

Very briefly, the silicones are organic compounds of the element silicon which combine many of the properties of organic and inorganic materials. Although silicon does not appear in free form anywhere on earth, it is three times as plentiful as iron and six times as abundant as aluminum. Because of this great abundance and the unusual chemical behavior of silicon itself, thousands of different silicones are theoretically possible.

At present, several hundred silicone products are being marketed in various basic forms which include rubbers, gums, fluids, emulsions, varnishes, resins, oils, greases, adhesives and molding powders. And in one way or another, the automotive industries use silicones of most types.

Regardless of its physical form, any individual silicone product will possess one or more of these general properties:

Outstanding resistance to high temperatures. Silicone-based paints may be usable up to 1000 F and higher; some silicone rubbers are useful at temperatures as high as 600 F.

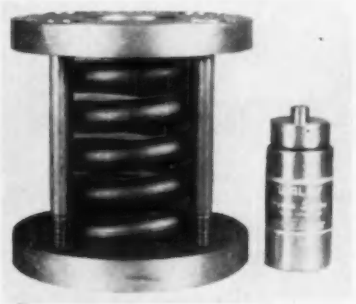
Excellent performance at low temperatures. Nearly all silicone rubber is useful at temperatures as low as —75 F and some will remain flexible at —150 F or even lower. Silicone fluids can flow and lubricate at —100 F.

Water repellency. Silicones are generally resistant to moisture and may be used to impart water repellency to many materials. Among them: all types of fabrics, leather, electrical insulation, masonry.

Resistance to weathering and ozone. Silicones are unusually durable and offer outstanding resistance to ozone and the elements.

Inertness. Silicones are chemically stable and will not attack most metals. Nor are they affected by most metals or many solvents and fluids.

Excellent electrical properties. Silicones offer many advantages to designers of all types of electrical equipment because of their outstanding electrical characteristics. Their potential in electrical uses was the basis for the first intensive industrial research in silicone chemistry. General Electric Co., which developed silicone rubber and the so-called direct process for producing the intermediates from which silicones are made, began its work on silicones more than 20 years ago.



Liquid spring manufactured by Wales-Strippit Corp. is shown here with the far larger conventional spring unit which it replaced.

SILICONE RUBBER

The characteristics of the silicone family are broadly shared by silicone rubber, the first member of the family to see widespread use in the automobile industry. In fact, the first really sizable civilian commercial uses for silicone rubber were Diesel engine gaskets and spark plug boots in the early '50s. However, the aircraft industry very early developed into the major user of silicone rubber, and is today its biggest consumer.

The spark plug boots, or sleeves or covers as they are variously called, are becoming increasingly important because of the demands of high-compression engines. The higher electrical voltages required for operation of these engines emphasize the need for reducing current leakage and keeping plugs dry. At the same time, engine and body designs have boosted operating temperatures at and near the block up to and often above the 400 F mark. Only silicone, among the rubbers, can withstand continued exposure to such temperatures. At least one major builder is considering such boots for 1958 models, following a pattern set by Oldsmobile several years ago.

Silicone rubber insulation is now commonly used for ignition systems of ordnance vehicles which may be required to operate under water. There are signs that higher temperatures around the block may establish a demand within the immediate future for similar insulation on passenger car systems.

Resistance to oil and to high temperatures qualified silicone rubber very early for engine and transmission seals. Believed to be the first such general application was an O-ring for fluid drive transmissions. With normal operating temperatures of current automatic transmissions running about 300 F and going as high as 350 F, no other rubber could survive.

A specialized characteristic of silicone rubber—its extremely low coefficient of friction — made possible its use in automatic transmission and drive pinion seals. Unlike other elastomers, silicone rubber has little tendency to cause wear on metal parts and thus the danger of lubrication leaks is reduced.

Because these features are more significant in commercial vehicles subjected to much more arduous use, such seals are somewhat more common in buses, trucks, taxis and other commercial vehicles than in passenger cars.

Another special property of silicone rubber is extremely low compression set. Silicone rubber resists deformation or compression set after prolonged pressure better than any other elastomer. Thus it makes ideal seals, gasketing, and mountings which will be serviceable over extended periods of use.

Schwitzer Corp. modulated fan drive, produced for Mercury automobiles, incorporates a silicone fluid in the housing to which the fan itself is bolted. Fluid permits fan to idle when full cooling is not required.

SILICONE FLUIDS

From some viewpoints, the most interesting and provocative members of the silicone family are the silicone fluids, which are manufactured in a range of viscosities of 5 to 1,000,000 centistokes. Like most silicones, they have unusual temperature stability, exhibiting less change in viscosity with temperature than any other fluids. In fact, over a range of −10 to + 210 degrees F, the viscosity change in silicone fluids is only 1/80th that of a petroleum oil of 100 viscosity index.

Other characteristics include high compressibility, high resistance to shear, unusual chemical inertness, and very high flash and ignition points. These properties enable designers to develop practical devices which once were only theoretical.

Damping and shock-absorbent devices are obvious uses. The Schwitzer modulated drive fan introduced by Mercury in 1957, for example, capitalizes on the relatively con-

(*Turn to page* 104, *please*)

Semi-Permanent Mold Process *for Making* TORQUE CONVERTERS

By
Joseph Geschelin

International Harvester Co. Produces Aluminum Alloy Torque Converter Elements to Close Tolerances and with Fine Finishes by Centrifugal Casting

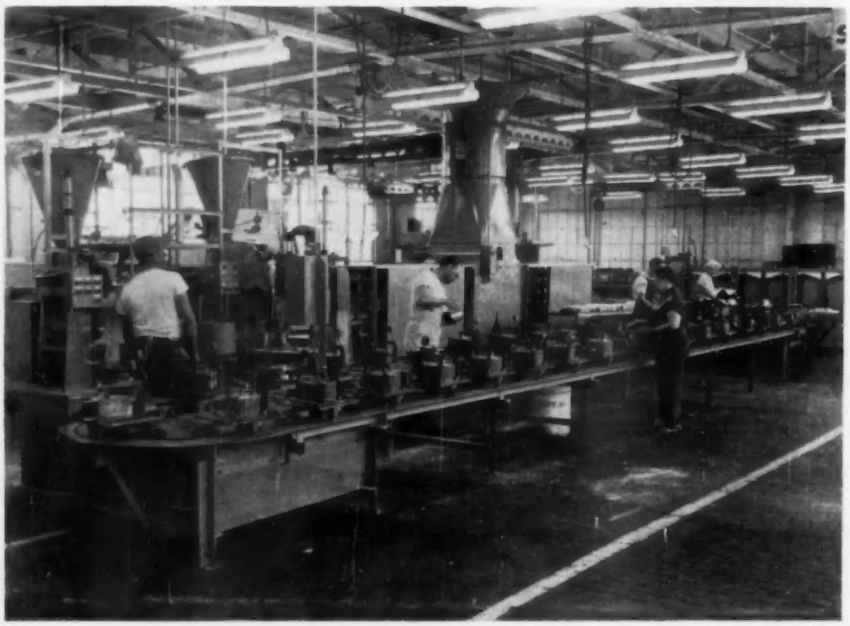


FIG. 1—Cores for the torque converter elements are prepared on this merry-go-round line. Each of the pallets on the conveyor carries the basic core mold which contains the pattern for a specific kind of core.

THE three-element torque converter produced by International Harvester Co. for use in the Select-O-Matic drive has three major components—the pump, turbine, and reaction member. All three are aluminum alloy castings made by techniques developed at the Fort Wayne Works.

Before describing the special procedures followed in the Precision Casting Department, it should be emphasized that the flexibility of engineering design and high torque converter efficiency are dependent upon precision casting practice. For example, the improved performance of this torque converter depends entirely on the fidelity with which the hydrofoil configuration of blading is developed; upon fine surface finish; and accurate formation of radii, corners, and edges. These characteristics are responsible for smooth fluid flow, free from wasteful eddy currents.

We mentioned in an earlier article that Harvester has two basic converter sizes—13-in. and 14-in. diameters; and that each torque converter is tailored to suit the characteristics of an individual engine in the line. To accomplish this, it is necessary to change hydrofoil configuration or blade spacing or both for each converter. We shall show later how these operations are handled with standard tooling. Thus the flexibility so essential in handling specific vehicle applications is accomplished without cost penalty.

The procedure used in making torque converter elements may be termed a semi-permanent-mold process, employing centrifugal casting of the metal. The secret of the success of the project is found in the unique plaster formulation used in making the cores.

The plaster slurry is an established mixture of finely ground calcium sulfate and silica flour. The material is expensive but a high percentage of it is reclaimed after casting shakeout. This feature, plus the fact that the reclaim serves as an accelerator and improves the dimensional stability of a fresh mixture, aids considerably in cost economy and quality control.

The specified mixture of calcium sulfate and silica flour is weighed out and mechanically mixed to produce a homogeneous powder. Then this material is transferred to the machine at the left in Fig. 1. The machine has an indexing table and is arranged for an automatic cycle.

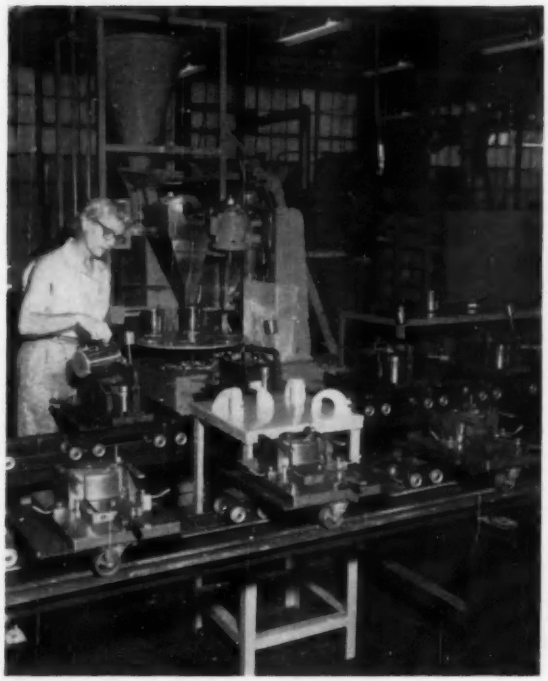


FIG. 2 — Station at which the plaster slurry is prepared for pouring into the core molds. Here the operator may be seen pouring the contents of one of the containers into a mold on the conveyor. The close-up of several of the molds also shows the adjustment pins on the bottom plate. These are fitted with bushings of various sizes to change the wedge angle of the core.

At the first station an accurately measured amount of the plaster mixture and water is fed into the container. At the second station the material is beaten into a homogeneous slurry by means of an electric mixer. The slurry now is ready to pour into the core molds (Fig. 2).

Meanwhile, the operators prepare the core boxes on the merry-go-round conveyor for pouring. A distinctive feature of the core box design is its flexibility. The basic core box has a simple adjustment that enables it to accommodate cores of any angular displacement. The base of the core box contains fixed pins for adjusting the angle of the wedge. If larger angles—less blades—are required, the operator places a bushing of the proper diameter over the pin and this, in turn, changes the wedge angle. Thus this simple change adapts the fixtures to the entire gamut of blade configurations.

After the core boxes have been fitted with the proper hydrofoil patterns and adjusted for wedge angle, the core box is locked, and as it passes the pouring station the operator pours the contents of the metal container into the spout. The plaster sets in air about nine minutes, making it possible to remove the core at the end of the travel of the conveyor.

Cores then are placed in containers on a conveyor and go through an air drying cycle to remove moisture. One of the advantages of the plaster used here is its dimensional stability. It remains true to form and size throughout the entire process.

The next major operation is the assembly of cores. This is shown in Fig. 3, where the operator is seen completing the core assembly for the pump element. A finished pump

FIG. 3—Close-up of the core assembly table. The operator is seen completing a pump core assembly, a finished assembly being found immediately to his left. At the extreme left is a completed reactor core assembly.

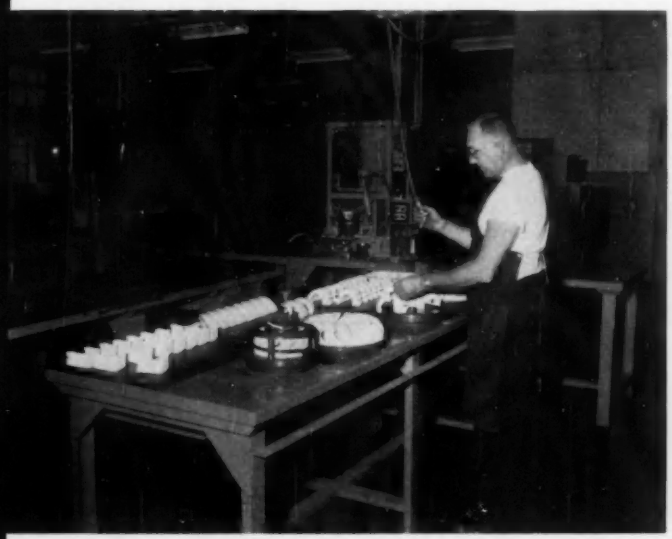


FIG. 4—Completed core assemblies are transferred to this station in preparation for the baking oven. The baking cycle takes 1½ hours. Besides removing moisture from the core, the treatment also preheats the drag.

core assembly is seen immediately to the left of the operator, and to its left is a completed reaction member core assembly. The view of the assembly table also shows the appearance of individual cores before assembly. All of these cores are beautifully smooth and have a high degree of polish and surface finish.

Finished core assemblies then are transferred to the station shown in Fig. 4 for baking. Here the operator places the core on the drag section of the main mold in preparation for placing in the oven. Baking serves a dual purpose. Besides removing moisture from the core, the treatment also preheats the drag. Baking takes 1½ hours.

At the exit end, the drag is removed from the oven and immediately placed in one of the centrifugal casting machines. Serving the group of casting machines are Lindberg low-frequency induction furnaces, arranged to function as melting furnaces for the aluminum alloy, and also as holding furnaces. After the operator has closed the mold, he picks up a ladle full of molten metal, pours it into the mold, then starts the centrifugal casting cycle. A full cycle takes about 6½ minutes.

Upon completion of the casting cycle, the casting is moved to another station where the core material is removed by means of an air hammer and is collected for reclaiming. The casting continues to the cleaning room where adhered plaster is removed. By the time this article is in print, the foundry will have in operation special ultrasonic equipment for doing this job. Following this the sprue is cut off in a lathe.

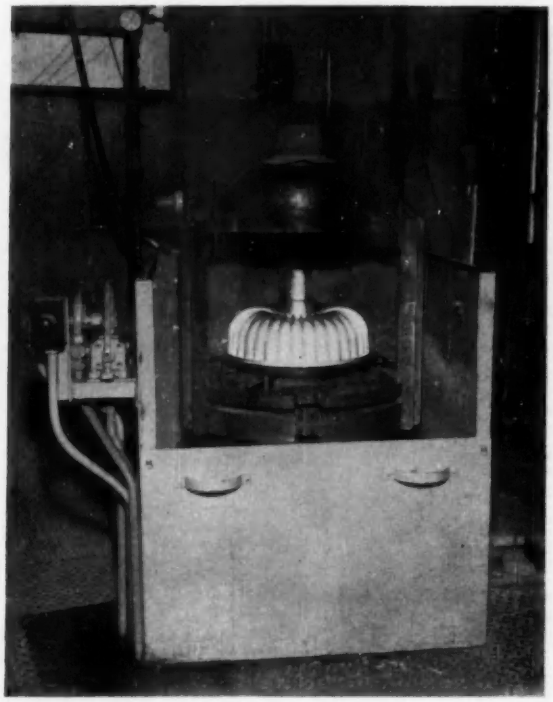


FIG. 5 —One of the centrifugal casting machines built by IHC. Here may be seen a finished pump casting ready for removal. The cope section is raised for this purpose as shown.

Castings now are ready for machining, except for the hydrofoil sections which require no further attention and are used as cast. The range of surface finish is from a minimum of 60 microinch to a maximum of about 30 microinch. To accomplish this result the patterns for the core boxes have a surface finish of 6 microinch.

It may be noted too that the reaction or stator member is cast integrally with the 52100 steel bearing race for the overrunning clutch assembly. To this end the machined race is used as an insert in the permanent mold. The race is finished with a series of fine serrations on the OD to provide a secure lock in the casting.

Statistical quality control analysis of regular production runs shows that 99.73 per cent of all parts are within a tolerance of ± 0.0108 in. Many critical tolerances fall considerably within engineering specifications. This is ample evidence that the process is sound and under complete control.

• • •

Several New Models Expected At Fall European Car Shows

Many new car models are expected to appear at the European 1957 Fall shows to be held in Frankfurt, Paris, London, and Turin.

For example, in the minicar class, the German NSU motorcycle firm and the Italian Piaggio Works (makers of the Vespa scooter) will introduce new economy ultra-light cars. The latter will be built by the French concern of ACMA.

A convertible with Fiat 500 components will be introduced by Bianchi, and the BMW Isetta may appear as a diminutive four-seater. In England, a number of very small car designs are approaching the production stage. It is unlikely, however, that many of them will be shown in 1957. However, one or two new sports cars are possibilities.

New medium-sized models are underway by German Ford and Vauxhall, while the Alfa Romeo 1900 and Renault Fregate are expected to get new bodies. The general trend is toward more angular body lines similar to those of the Citroen DS 19 and the Lancia Flaminia.

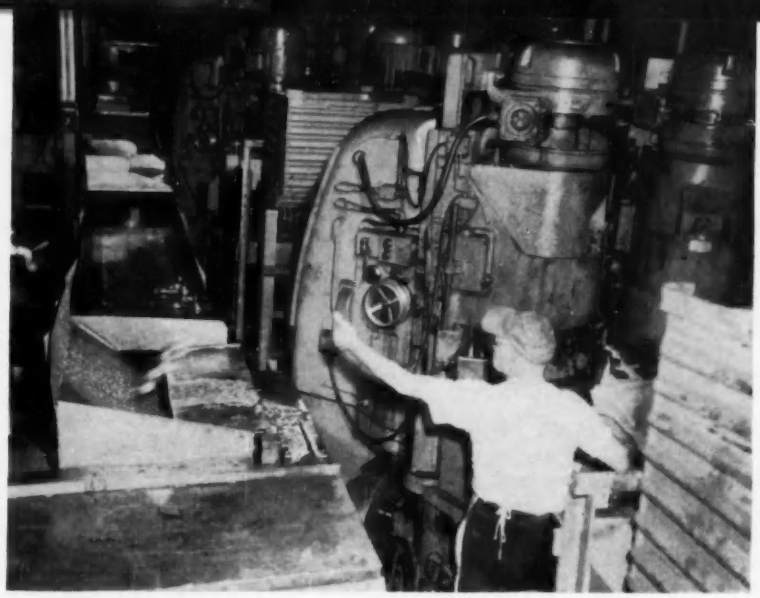
Further development and application of the automatic clutch are to be expected on the part of such producers as Mercedes-Benz. This leading European car manufacturer is also said to be readying another top-class model, but no announcement date has been set. No change in Volkswagen design is expected in the foreseeable future.

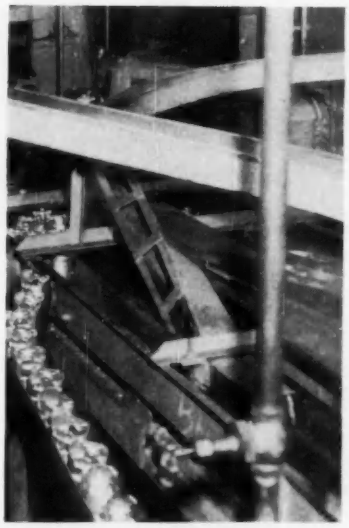
Du Pont First Half Sales Hit $996 Million Figure

Du Pont Co. has reported that its 1957 first half sales reached $996 million, for a 7.3 per cent gain over the $928 million recorded in the like 1956 period. Second quarter sales of $494 million exceeded the $468 million of the corresponding 1956 period.

Earnings for the first half of this year amounted to $4.30 a share. They compared to $4.01 a share for the first six months of 1956.

Steel Conveyor Belts in Chrysler Engine Plant

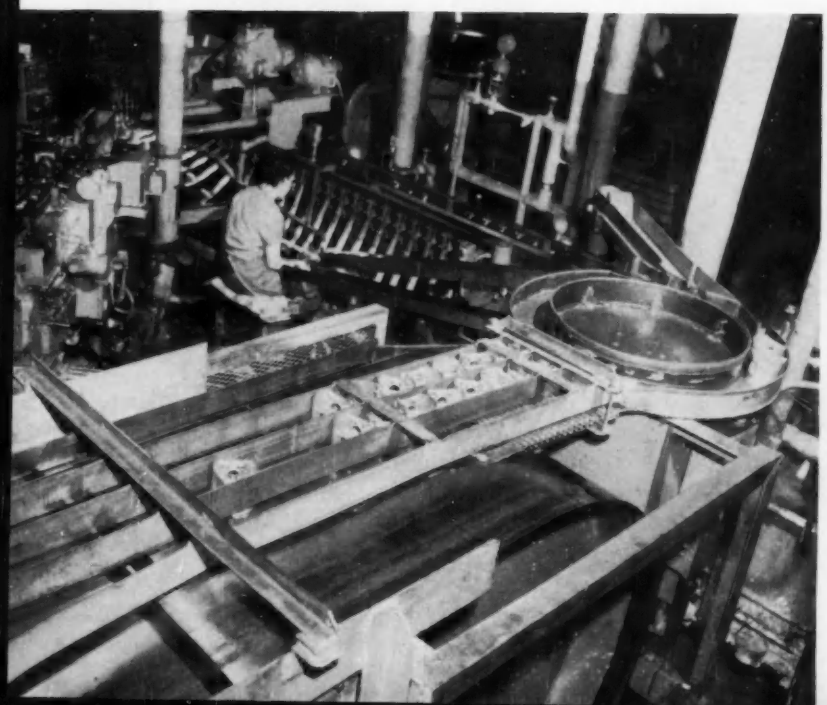




Above shows first 60-ft steel belt conveyor installed at the plant. Belt transports forged connecting rods following grinding operations.

Parts discharge into chutes at proper machine stations for additional operations. At this section of the belt, machine tools are located on both sides.

Below is shown discharge end of Sandvik steel belt conveyor. Parts are taken from chute and placed on arms of automatic tin-plating machine.



THE Chrysler Corp. at its Mound Road Engine Plant in Detroit is now using steel belts for conveying metal parts. Engineered by Sandvik Steel, Inc., the first steel belt was installed on a 60-ft conveyor a little over half a year ago. Its early success soon led to the installation of a second steel belt, this one on a 360-ft conveyor. A third belt is now on order and at least one other is being considered.

These installations have practically eliminated the troublesome problems of downtime and wear. With the steel belts, when the metal parts backlog, the belts slide along under them, smoothly and without damage. To date these belts have experienced virtually no downtime. They are expected to give years of service before being replaced.

The first steel belt, 0.040 in. thick by 24 in. wide, handles connecting rods. These forgings are thrown onto the belt after being ground (both sides) for conveyance to the next production operation. The belt travels within a channel-shaped slide-pan; the bottom of the pan supports the belt and the sides prevent rods from falling off. Lubricant brought onto the belt from the grinding operations works between the belt and the pan and provides a lubrication film which reduces wear. To minimize impact when the forgings hit the belt, deflector-boxes are mounted at each machine station and these break the fall of the rods as they are thrown onto the belt. The boxes also virtually elimi-

(*Turn to page* 100, *please*)

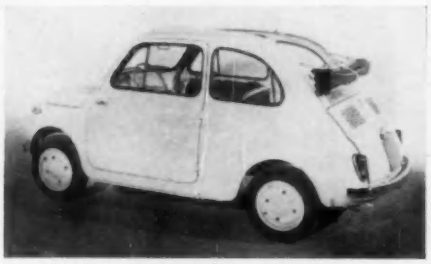
Fiat Introduces

A SMALL two-passenger car, the "New 500," has been introduced by the Fiat Company of Turin, Italy. While following the Fiat tradition of small vehicles, it incorporates a new two-cylinder air-cooled engine at the rear. Body outlines, the unit body and frame construction and the independent suspension of all four wheels are reminiscent of the four passenger 600 introduced in 1955. Only one body model is offered—a folding soft top.

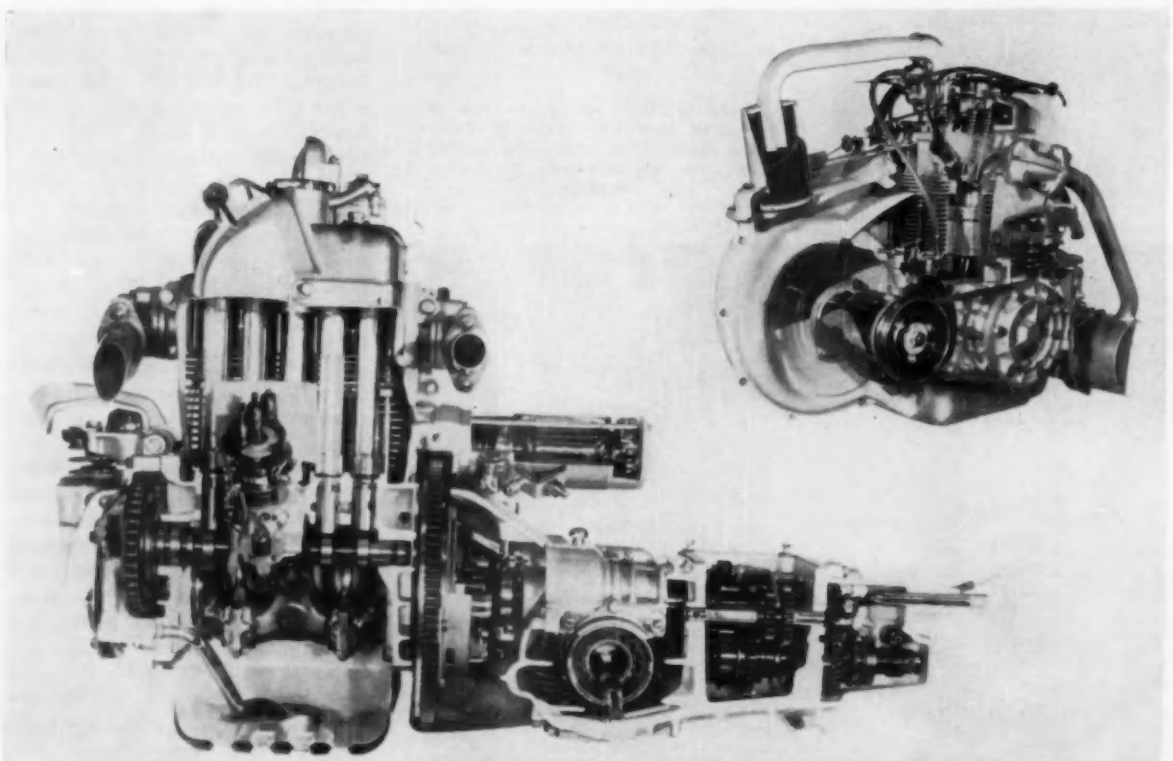
While the "New 500" is already in production, the affiliated firm of Bianchi in Milan is preparing a deluxe version of it, using the 500 engine, transmission and suspension units, but building their own convertible two-passenger body. This will probably be displayed in September. In addition, the Austrian firm of Steyr, where various Fiat models have been assembled in the past, is using the Fiat body and front suspension in connection with its own two cylinder, horizontally-opposed engine and rear swing axle for a new model which is scheduled for early appearance.

As illustrated, the engine of the "New 500" is equipped with a centrifugal blower which draws air in at an opening placed between the engine hood and the rear window. Intake air is branched off from the cooling air duct, and a second branch leads part of the air stream past the bottom surface of the oil sump for cooling purposes. After the cooling air has passed the fins of the two cylinders and the cylinder head it is led out of the car in warm weather, or into the vehicle interior for heating in winter. An additional passage leads air back to the intake. This is blocked by a plate valve in summer, but is opened by a thermostatic valve as soon as outside air temperature falls below 68°F. It adds preheated air to the intake and not only allows for quicker warming up of the engine, but prevents icing of the carburetor.

A novel mounting for the engine



Left rear quarter view of the car



Cutaway views of the engine and four-speed transmission

New Rear-Engine Car

By Robert Braunschweig

has been developed. This incorporates a lever with hinges on each end and a spring which is interposed between the lever and the engine. The hinge on the engine side is fitted with a rubber bushing. This arrangement permits the engine to carry out appreciable vertical movements which are not transmitted to the body unit, whereas very little torque reaction movement is possible.

A very ingenious oil filter is built into the engine. This is a cylindrical cavity in the cooling fan drive pulley, which is interposed in the oil stream and which acts as a centrifugal filter. According to the makers' claims this oil filter requires attention only when complete engine overhauls are carried out.

Interior space is quite reasonable despite the very short wheelbase of 72.5 in. In the front overhang there is room for the passengers' legs, the 5.5 gallon fuel tank, the spare tire, the battery and the set of tools.

Final drive ratio is 5.125 to 1, and road speed at 1000 rpm in top gear is 12.6 mph. The four-speed transmission has no direct ratio, and the three upper ratios are fitted with dog clutches instead of the more expensive synchromesh units.

Production of the new model has already begun, but export sales are not expected to start before September.

Phantom view of the new Fiat 500

Cast alloy crankshaft of the two-cylinder engine

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Edsel Div. to Spend $4.8 Million

The Edsel Div. of Ford Motor Co. will spend about $4.8 million with Buffalo, N. Y., area companies in its first year, according to J. C. Doyle, Edsel general sales and marketing manager. The figure does not include work done for Edsel in the Ford Buffalo stamping plant.

Mr. Doyle also said there is a chance that the Edsel may be assembled in Ford's Buffalo plant. However, he added, this step would be taken only if the other six Ford plants producing the Edsel in other parts of the country cannot produce enough of the cars.

The major Buffalo suppliers will include Trico Products Corp., which will make Edsel windshield washer-wiper controls and assemblies. Houdaille Industries, Inc., will make Edsel tools in its Manzel Div. plant in Buffalo and bumpers in its Huntington, W. Va., plant.

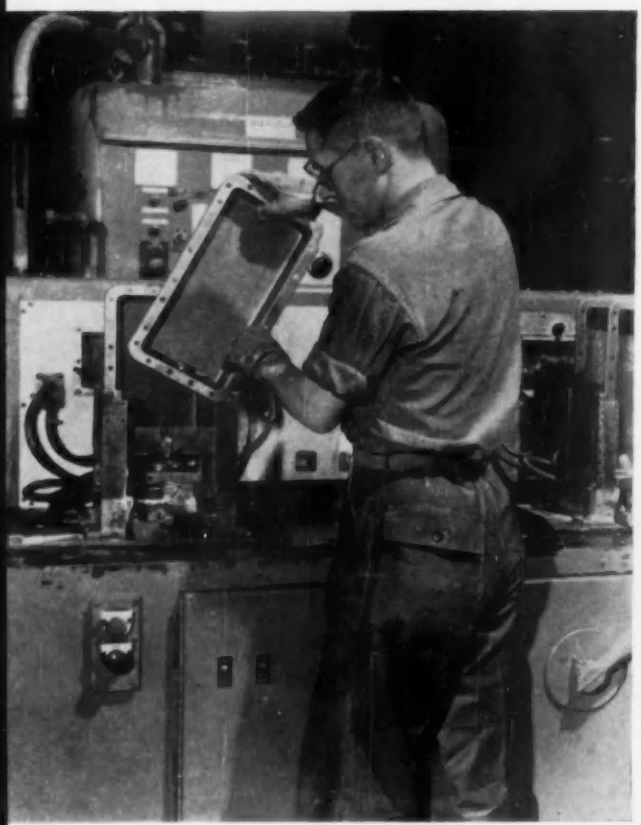
A local unnamed company will make rear-view mirrors for Edsel, and a number of other local companies will be Edsel suppliers also, Mr. Doyle said.

Oil pans drawn from steel blanks for use on Buick Dynaflow transmissions. At right is the steel bushing and the ring of Easy-Flo silver alloy that is placed between the bushing shoulder and the pan after fluxing. Pan at left has the bushing brazed in place.

FIG. 1

FIG. 2

Fluxed and assembled pans are brazed in the two-station induction brazing machine. Vertical orientation keeps bushings properly located and enables them to settle flush against the interior wall of the pan when the silver alloy melts. The two pans in the station to right of operator are in the brazing cycle.



Silver Brazing OIL PAN BUSHING *in* Dynaflow Transmission

At the Buick plant at Flint, Mich., silver brazing provides a one-step method for installing the drain bushing in the oil pan of the Dynaflow transmission. The 1½-in. bushing, which is internally threaded to receive the drain plug, must be securely installed in a hole in the end of the drawn steel oil pan. The quickest and most practical way to do this and obtain a permanently leak-free joint is by silver brazing. In addition this joint must be strong, a requirement that is easily satisfied since a well-brazed joint between steel parts will have a shear strength in torsion ranging from 35,000-48,000 psi, depending on the type of steel.

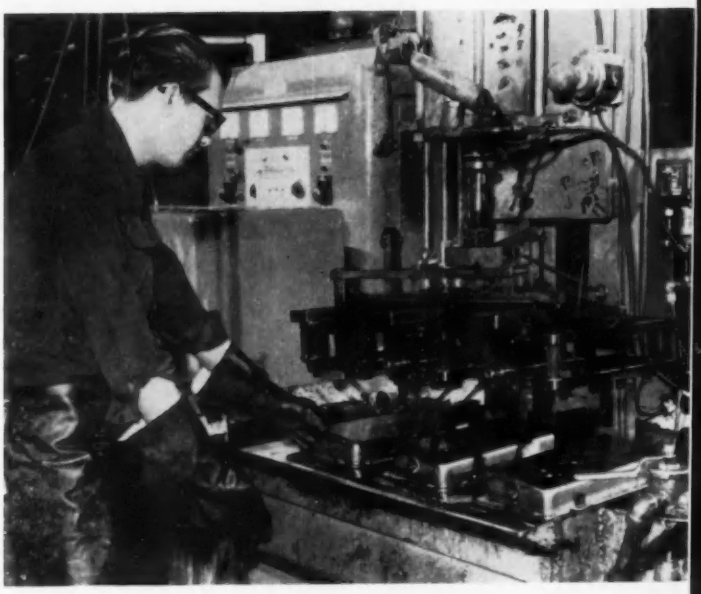
The oil pan, before and after the bushing is brazed in place, is shown in Fig. 1. Before assembly the bushing and pan, which have previously been thoroughly degreased to remove shop oil and dirt that might interfere with the soundness of the joint, each receives a coating of Handy-Flux. The operator fluxes the end of the bushing by dipping it directly into the flux pot and fluxes the joint area of the oil pan (both surfaces) by brushing. He then slips a ring of 3/16-in. round Easy-Flo 45 silver brazing alloy, manufactured by Handy & Harman, onto the bushing. Next the bushing is inserted in the hole from inside the pan, with the ring of silver alloy nesting between the shoulder on the bushing and the inside wall of the pan. With the ring in this location, the alloy brazes the bushing to both the wall of the pan and the circumference of the hole.

The brazing setup, shown in Fig. 2, consists of a two-station 25-kw Welduction heating machine containing two induction coils at each station. The pans are placed vertically, bushing-end down, in guide rails which position the protruding edge of the bushing within the diameter of the induction coil. Besides saving space, another advantage of brazing the assembly with the pan vertical is that the bushing seats itself against the pan by gravity when the alloy ring melts. Induction heat is advantageous for this type of joint because it localizes the heating at the joint area, so that relatively little heat is absorbed by the heavy

bushing. The setup is designed with the induction coil located on the outside of the pan, so the heat will draw the molten Easy-Flo alloy all the way through the joint and produce a fillet around the protruding edge of the bushing.

After loading the fixtures the operator starts the automatically-timed brazing cycle and shifts to the second heating station to remove the previously brazed and cooled pans. This two-station brazing setup is capable of producing 240 brazed joints per hour. From the brazing machine the operator places the pans in a shallow tank containing a mixture of soluble oil and water to remove the flux while it is still warm.

Every pan is then checked for joint soundness in the pneumatic test machine shown in Fig. 3, which handles three pans per test cycle. The pans are placed open-side down on a ½-in. thick rubber pad resting on a vertical movable platform. Upon actuation by the operator, a set of three pneumatically-operated frames descends onto the flange around the base of the pan, forming an air seal between the flange and rubber pad. As soon as these holding fixtures are in position, rubber sealing disks mounted on the ends of a toggle linkage are pressed into the opening of the bushing. The whole assembly is then lowered pneumatically into the test tank and pressurized air is admitted to the interior of each pan through jets extending up through the rubber pad. Defective joints show up immediately as a train of bubbles. Leakers can be quickly repaired by refluxing the joint and applying additional Easy-Flo alloy by hand with an oxy-acetylene torch. The defect rate is quite low, usually less than one per cent.

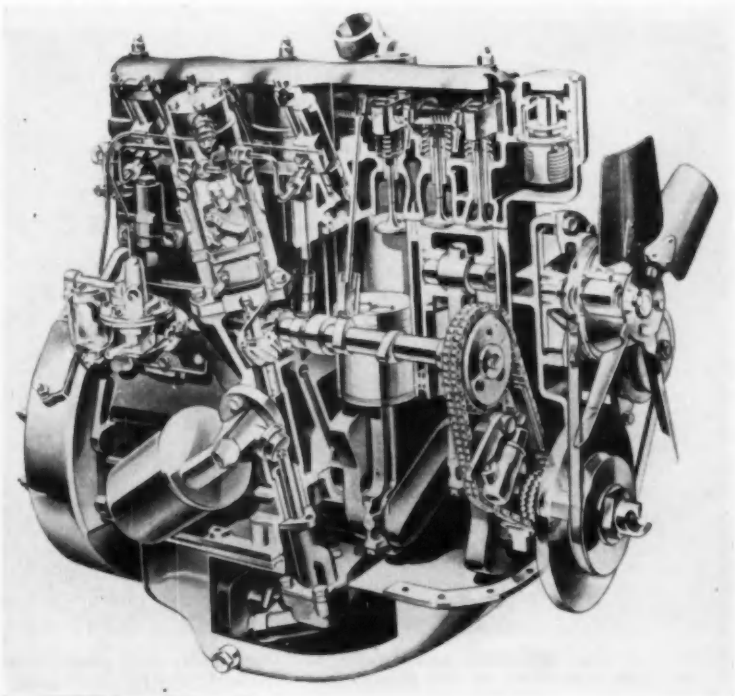


Test machine clamps, dunks and introduces pressurized air into the interior of three pans simultaneously to check soundness of joints. Assemblies that pass this test are passed along to transmission assembly lines.

FIG. 3

Rover Brings Out New Diesel Engine

Cutaway view of the new Rover Diesel



ROVER is now producing a four-cylinder Diesel engine for the Land-Rover which is interchangeable with the existing gasoline unit, permitting the same transmission assemblies to be used. Of 3⅜-in. bore and 3½-in. stroke, it has a displacement of 125 cu in., and develops 52 hp at 3500 rpm. Features of the valve system are a high-lift camshaft of case-hardened steel, roller-type tappets to minimize cam wear, and rubber sealing rings on the valve guides. A hydraulic tensioner on the timing chain is fed with oil from the lubricating circuit. Twin-jet Pintaux-type injectors are designed to spray fuel into the hottest part of the Ricardo Comet V combustion chambers for easy starting. The CAV.DPA distributor pump has a single cylinder and opposed pistons with inlet metering.

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS

PRODUCTION—VEHICLES—AIRCRAFT

By Samuel Cummings

NUMERICALLY CONTROLLED MACHINES

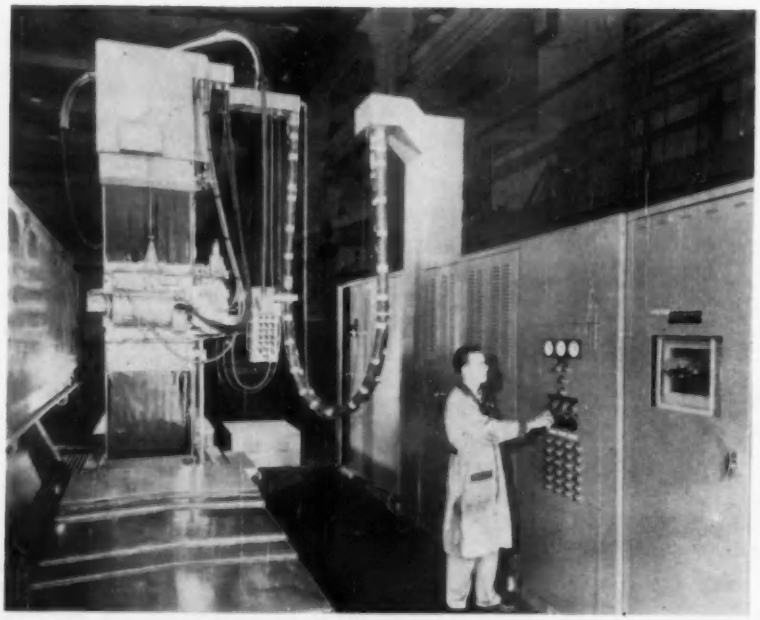
Giddings & Lewis Machine Tool Co. has shipped the first numerically controlled production model of a variable-axis airframe profile milling machine to the Lockheed Aircraft Corp. The new machine, called the Variax, will be used to turn out spar, skin, and wing sections of the supersonic F-104 Starfighter jet interceptor.

According to company officials, the Variax is the first machine of its kind to operate solely by magnetic tape commands. Guided by the Giddings & Lewis Numericord system of control, the Variax automatically sculptures jetplane spar, skin, and wing sections to the most complicated geometric contours. And with Numericord, numerical data to control machine movements is transferred directly to the magnetic tape without the intermediate step of translation into a binary code.

The new machine's performance derives from a combination of five movements: horizontal movement of the column upon its runway; vertical movement of the saddle on its column ways for 360 deg path control in the plane of the angle plate where the work is mounted; depth motion through movement of the head along the spindle axis; head swiveling in the saddle plane on segmental ways to achieve a transverse tilt function; and column swiveling, on an axis coincident with the extension of the cutter center line, giving longitudinal tilt and providing to the spindle angular motions that have a common locus point on the spindle axis. Thus, a programming plane is provided where zero movement of the cutter axis exists during angular displacements of the tool, eliminating corrections and compensations that would otherwise be necessary.

Giddings & Lewis also announced that the Defense Department has accepted the first regular production model spar and skin milling machine ever to be equipped with numerical control. The machine will be shipped to the Denver plant of the Martin Co., where it will be used to produce vital airframe parts for the "Titan," intercontinental ballistic missile.

Both machines represent initial deliveries, in their respective design categories, on orders placed with Giddings & Lewis by the Air Material Command of the Air Force.



Giddings & Lewis magnetic-tape controlled, airframe profile milling machine will turn out components for the supersonic F-104 Starfighter jet interceptor

ELECTRONIC BALANCER

General Motors Research Staff has developed a brand-new electronic device that detects unbalance in automobile engines at any running speed. The new unit, known as the Pulse Synchronized Unbalance Indicator (PSUI), is now in limited use at several GM divisions.

The PSUI, which is mounted in a portable cabinet, uses seismic magnetic pickups at each end of the engine to detect unbalance, and timing or synchronized pulses from the engine ignition to locate the unbalance.

The unit is installed at the end of the engine production line. When an engine is completely assembled, it is mounted on a sim-

(*Turn to page* 94, *please*)

• • INDUSTRY STATISTICS • •

1957 WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending July 13	Weeks Ending July 6	Year to Date 1957	Year to Date 1956
PASSENGER CAR PRODUCTION				
Hudson	0	0	1,345	4,323
Nash	0	0	3,561	11,073
Rambler	1,967	1,323	53,890	47,759
Total—American Motors	1,967	1,323	58,796	63,155
Chrysler	2,400	1,609	78,623	69,745
De Soto	1,989	449	75,306	60,603
Dodge	4,778	4,410	179,810	116,168
Imperial	848	589	25,820	*
Plymouth	13,252	9,149	403,286	259,632
Total—Chrysler Corp.	23,267	16,206	760,845	506,148
Ford	31,099	19,576	870,557	749,414
Lincoln and Continental	883	0	24,828	30,541
Mercury	5,508	1,593	178,585	148,905
Total—Ford Motor Company	37,490	21,169	1,073,970	928,860
Buick	2,837	2,291	244,101	338,042
Cadillac	2,697	2,011	89,740	88,621
Chevrolet	31,586	25,116	848,706	924,869
Oldsmobile	5,232	2,487	236,361	264,047
Pontiac	5,609	1,962	206,243	199,504
Total—General Motors Corp.	47,961	33,867	1,625,151	1,813,083
Packard	4	8	6,098	13,289
Studebaker	1,247	1,116	33,733	48,667
Total—Studebaker-Packard Corp.	1,251	1,124	39,829	61,956
Checker Cab	78	45	2,438	1,870
Total—Passenger Cars	112,014	73,734	3,561,029	3,375,072
TRUCK PRODUCTION				
Chevrolet	6,903	4,260	196,322	205,354
G.M.C.	1,131	685	37,270	53,600
Diamond T	120	111	2,743	2,744
Divco	32	16	1,851	2,179
Dodge and Fargo	1,545	1,049	44,125	49,105
Ford	7,275	4,347	196,730	170,882
F. W. D.	17	10	630	986
International	2,800	2,317	64,106	77,145
Mack	340	188	9,303	10,164
Reo	134	79	2,244	2,051
Studebaker	147	176	6,151	8,417
White	252	143	8,683	10,421
Willys	1,708	823	35,831	33,335
Other Trucks	80	77	2,402	3,683
Total—Trucks	22,484	14,289	610,371	630,096
Buses	83	55	2,400	2,423
Total—Motor Vehicles	134,581	88,078	4,173,800	4,007,561

* Included with Chrysler.

RETAIL CAR SALES BY PRICE GROUPS*

NUMBER OF CARS

Price Group	May 1957 Units†	May 1957 % of Total	May 1956 Units†	May 1956 % of Total
Under $2,000	1,036	.19	107,627	19.49
$2,001 to $2,500	344,740	63.81	289,280	52.40
$2,501 to $3,500	152,111	28.15	132,860	24.06
Over $3,500	42,417	7.85	22,378	4.05
Total	540,304	100.00	552,145	100.00

Price Group	Five Months 1957 Units†	Five Months 1957 % of Total	Five Months 1956 Units†	Five Months 1956 % of Tota
Under $2,000	17,434	.70	473,721	18.83
$2,001 to $2,500	1,528,376	61.37	1,383,257	54.97
$2,501 to $3,500	725,636	29.14	554,569	22.04
Over $3,500	218,996	8.79	104,609	4.16
Total	2,490,442	100.00	2,516,156	100.00

DOLLAR VOLUME OF SALES

Price Group	May 1957 Dollars	May 1957 % of Total	May 1956 Dollars	May 1956 % of Total
Under $2,000	$ 1,581,972	.11	$ 211,696,841	16.35
$2,001 to $2,500	778,550,003	54.49	621,240,984	47.97
$2,501 to $3,500	431,700,610	30.21	365,105,253	28.20
Over $3,500	217,080,277	15.19	96,833,717	7.48
Total	$1,428,912,862	100.00	$1,294,876,495	100.00

Price Group	Five Months 1957 Dollars	Five Months 1957 % of Total	Five Months 1956 Dollars	Five Months 1956 % of Total
Under $2,000	$ 32,615,062	.50	$ 925,957,799	15.72
$2,001 to $2,500	3,430,673,467	52.61	2,980,273,403	50.57
$2,501 to $3,500	2,045,460,752	31.36	1,538,689,400	26.12
Over $3,500	1,013,033,856	15.53	447,022,040	7.59
Total	$6,521,783,137	100.00	$5,892,142,642	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four-door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

1957 NEW REGISTRATIONS

Based on data from R. L. Polk & Co.

Arranged by Makes in Descending Order According to the 1957 Five Months' Total

NEW PASSENGER CARS

MAKE	May 1957	April 1957	May 1956	FIVE MONTHS 1957	FIVE MONTHS 1956
Ford	139,127	134,506	123,114	613,829	545,037
Chevrolet	134,322	126,435	147,942	594,634	656,560
Plymouth	58,202	56,512	46,841	259,435	214,294
Buick	35,198	38,962	50,770	185,764	284,134
Oldsmobile	33,699	35,228	42,069	170,439	198,640
Pontiac	30,359	31,340	33,012	143,863	160,649
Mercury	27,118	27,154	26,117	121,872	118,281
Dodge	25,332	25,238	20,855	112,950	92,797
Chrysler	13,414	13,871	11,221	64,159	52,242
Cadillac	13,165	12,804	13,539	62,587	61,376
De Soto	9,807	10,689	9,712	48,913	44,527
Rambler	9,164	8,154	6,860	35,043	30,526
Studebaker	5,129	5,433	7,382	25,604	38,119
Lincoln	3,071	3,647	4,144	16,926	16,021
Nash	986	1,074	2,601	5,309	12,639
Metropolitan	1,036	852	657	4,056	2,077
Packard	534	629	3,363	2,338	15,009
Hudson	466	581	1,536	2,827	5,723
Continental	89	67	132	423	832
Misc. Domestic	417	371	431	1,705	1,357
Foreign	15,699	15,046	7,716	62,636	31,870
Total—All Makes	556,324	548,609	560,014	2,553,832	2,548,710

NEW TRUCKS

MAKE	May 1957	April 1957	May 1956	FIVE MONTHS 1957	FIVE MONTHS 1956
Chevrolet	28,125	24,225	26,455	121,108	126,710
Ford	28,276	26,348	25,304	111,022	110,989
International	8,585	7,344	10,267	38,040	45,717
G.M.C.	5,651	5,892	7,669	27,396	36,383
Dodge	4,450	4,447	5,044	20,382	23,671
Willys Truck	1,212	1,194	1,177	6,418	5,399
White	1,246	1,228	1,484	5,897	6,765
Mack	1,257	1,215	1,269	5,489	5,494
Studebaker	644	635	915	3,297	4,310
Willys Jeep	504	521	760	2,540	3,295
Diamond T	268	323	361	1,452	1,729
Divco	282	331	312	1,293	1,407
Reo	200	197	289	1,021	1,234
Kenworthy	70	106	127	388	497
Brockway	98	51	99	307	436
Peterbilt	53	59	64	225	214
F.W.D.	25	43	44	221	189
Misc. Domestic	90	84	81	361	447
Foreign	1,272	1,217	296	4,821	1,620
Total—All Makes	82,308	75,438	84,997	351,483	376,506

Overhead Rail Setup Halves Painting and Drying Time

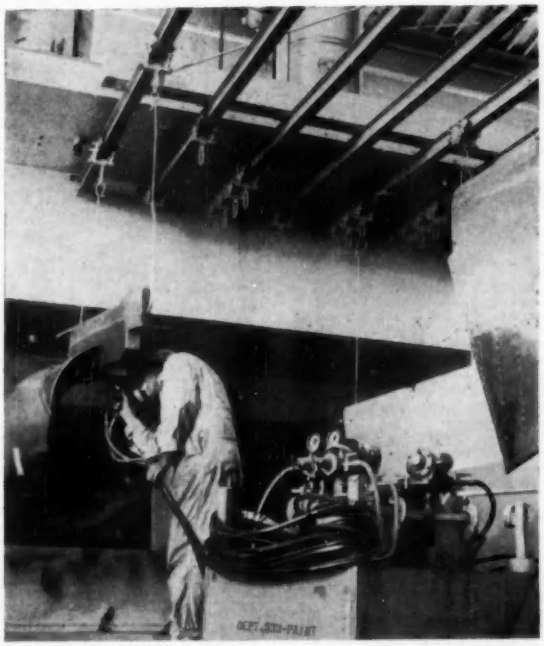
By D. C. Townsend
Foreman, Dept. A2-533
Culver City Facility, Douglas
Santa Monica Division

A NEW rail suspension installation at the Culver City facility of Douglas Aircraft Santa Monica Division has halved painting and drying time and conserved most of the area formerly required for drying parts for Douglas airliners.

The overhead system is composed of eight I-beams suspended parallel and pointing to the water wall of the spray painting booth. Standard four wheel rollers engage the bottom flanges of the I-beams and removable hooks suspend from the roller carriages.

Formerly most of these parts were painted flat on one side on rotatable tables and then toted to drying areas for four to six hour drying intervals depending on part. When the painted sides were dry the parts were again handled, returned for paint and the drying period repeated.

Parts are now hung on the overhead system, painted on all sides with one handling and then rolled to the end of the line for drying. There is only one load and unload in the present operation and one drying period for both sides of the parts. Stacked vertically from the overhead rails, far less space is also required for the drying of the parts.



Spray painting parts before water wall. A variety of parts may be hung from standard rollers that run on standard I-beams.

Parallel I-beams support parts for painting on all surfaces. When painting is complete parts are rolled to right for drying.

50th Anniversary Meeting of the ASAE

By Kenneth Rose

THE American Society of Agricultural Engineers, holding its 50th Anniversary meeting at Michigan State University, East Lansing, heard John L. McCaffrey, chairman of the board of International Harvester Co., call upon the group to help shape the change taking place in agriculture. More than 1000 members, Government officials, industrialists and educational leaders heard speakers from this country and abroad call for more "automation" in agriculture to permit fewer farmers to supply the Nation's needs for food and fiber.

In his talk, "The Next Fifty Years," given at the Golden Anniversary Dinner, Mr. McCaffrey said that it is one of the great achievements of man that, within the last few generations, the heretofore ever-present threat of starvation has ceased to exist. The technological development of American farming is the foundation for all other developments, he said. An urban civilization such as ours can be produced only when a well-equipped minority can produce essential food. Looking back at the past 50 years, 35 per cent of our population lived on the farms in 1907, compared to only 13 per cent today. This was accomplished by mechanization of the farm work. It has been predicted that by 1975 the farm population will be only about six per cent of the then labor force. A part of that outlook is a challenge to the agricultural engineer—to find ways to make it possible for a small fraction of the labor force to feed all the rest.

The first and most obvious need of the farmer in the future will be more power, he continued. "More power for use in and around the barn and the farm buildings, of course. But above all, more power for field operations." To illustrate the trend, he said that the top farm tractor in International Harvester's present line has 50 per cent more horsepower than their top item in 1940. Whereas two-row field equipment was the standard in 1940, four-row equipment is now commonplace, and six-row machines of many kinds are being rapidly approached.

Along with the increase in power there have been remarkable developments in the use of power, especially hydraulic devices, for control of farm implements from the tractor seat. Tractor transmissions provide a wider range of speeds, and particularly have been developed to provide torque multiplication in difficult situations. There is a strong trend toward multiple-use machines. Along with all this, there must come simplification of controls so that the machines can be operated by persons not technically trained, even though this will involve some added cost. Servomechanisms and feedback principles hold out hope for this.

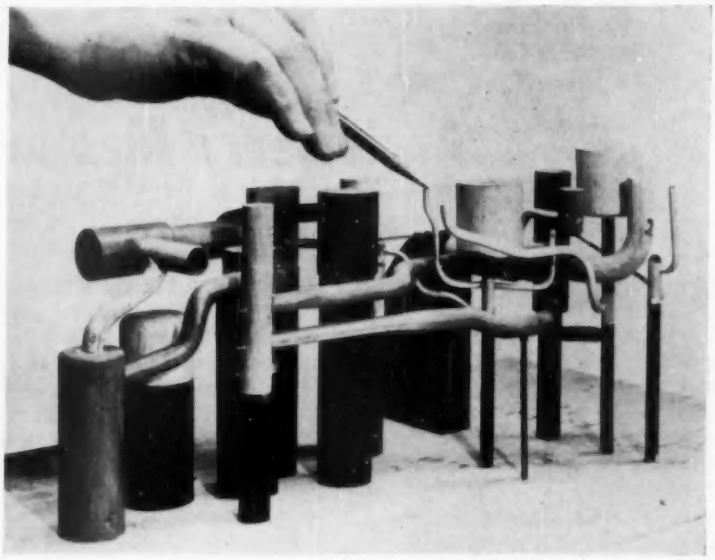
"In the last year a good deal has been said and written about new types of engines, and about the eventual disappearance of the internal combustion engine as we now know it," Mr. McCaffrey said. "There probably is no major producer of engines who is not carrying on experimental work with gas turbine engines and with free piston engines. These experiments are for the most part still in their earlier stages, and they bristle with unsolved problems. Nevertheless, they will continue and probably meet with eventual success. The gas turbine and the free piston engine offer important advantages, if they can be perfected. Among those advantages are fewer moving parts, reduced weight, more efficient utilization of fuel, improved torque characteristics, and greatly simplified problems of power transmission." Power plants of this general kind may be in use well within our next 50 years, he said.

The implement industry is providing better planters and attachments for the planting of cotton, reported E. B. Hudspeth, of the Southwestern Great Plains Field Station, and W. C. Hulburt, assigned to seed placement machinery investigations at USDA, Beltsville, Md. One of the most difficult problems facing the cotton farmer is how to obtain a uniform stand of plants at a desirable spacing. A number of attachments are now available to permit seeding under a wide range of conditions.

Jack R. DeBacher, vice-president of Thor Power Tool Co., told the meeting that, although the population of the country was expected to exceed 220,000,000 by 1975, there would be ample food for everyone then, and "for as long as we can look ahead." Agriculture has caught up with hunger, and is now 20 years ahead of it, he said. The farmer will continue to buy the equipment he needs for this work, and many new devices, now used almost exclusively in industry, will show up in some form on the farm.

Many kinds of American farm equipment have spread to Sweden, and to all of Europe, Prof. Nils Berglund, director of the Swedish Institute of Agricultural Engineering, told the agricultural engineers. "Although Sweden today has a highly developed farm machinery industry of its own, the U. S. A. has during the past fifty years contributed to farm mechanization in Sweden both directly and indirectly." Sweden today has one tractor for each 65 acres of arable land, he said.

Sheathed-Tube CORES for Light-Alloy CASTINGS



Complexity of internally cored passageways in sand cast aluminum aircraft fuel control component is shown by this core mock-up. There are 17 cores, including seven sheathed-tube cores, which are simulated by wires; sand cores are simulated by wood.

SMALL, intricately shaped, unlined passageways in aluminum and magnesium alloy sand castings are being produced with a new sheathed-tube core, developed and in use during the past year by Howard Foundry Co., Chicago.

The new core consists of a preformed metal tube sheathed in a flexible refractory sleeve. Both the tube and the sleeve are removed after molding the casting. The tube is dissolved out by a chemical agent, while the sleeve is removed manually and serves as visual evidence of a clean passageway. Aluminum and magnesium alloys are not affected by the chemical.

The sheathed-tube core is being used in combination with ordinary sand cores. It is used only when it is impossible to mold a passageway with a sand core or when sand coring costs are higher.

The minimum practical sand core diameter is ¼ in. Anything less results in a fragile core that is easily broken in assembly. The excellent rigidity and dimensional stability of the sheathed-tube core makes possible the casting of ⅛-in. diam passageways. A core with this diameter can be cast up to 16 in. in length.

Larger core diameters can be cast in much longer lengths, go in many directions and assume many shapes with the contours of a casting. Howard is presently casting a sheathed-tube core that has a 5/16 in. diam and is four feet long.

Passageways for transmitting oil, fuel, coolant, and hydraulic fluids may be internally "wrapped" around a large cylinder in one continuous line with Howard's new core. As a result, fluid lines do not have to be attached to exteriors of cast components and a series of short holes, which require bosses, do not have to be drilled.

• • •

Light Gas Turbine Engine Under Development by Army

A new lightweight gas turbine engine is now under development by the Army.

The engine, including accessories, weighs only 326 lb, and is approximately 44 in. in length, 31 in. in width, and 29 in. in height. It is a product of the Corps of Engineers' Research and Development Laboratories and AiResearch Mfg.

The unit is designed to meet the Army's requirement for a prime mover in a lightweight, high-speed, 400-cycle, 100-kw engine-generator set, and other applications where portability is paramount.

Designed to produce 170 hp under extreme environmental conditions, it will be capable of producing 286 hp at 60 F and sea level conditions. The estimated brake specific fuel consumption is 1.25 lb/bhp-hr at the 170-hp design point and 1.08 lb/bhp-hr at maximum output. Future growth potential to 389 hp has been included in the original design, and eventual improved fuel economy to 0.557 lg/bhp-hr through use of a regenerator is anticipated.

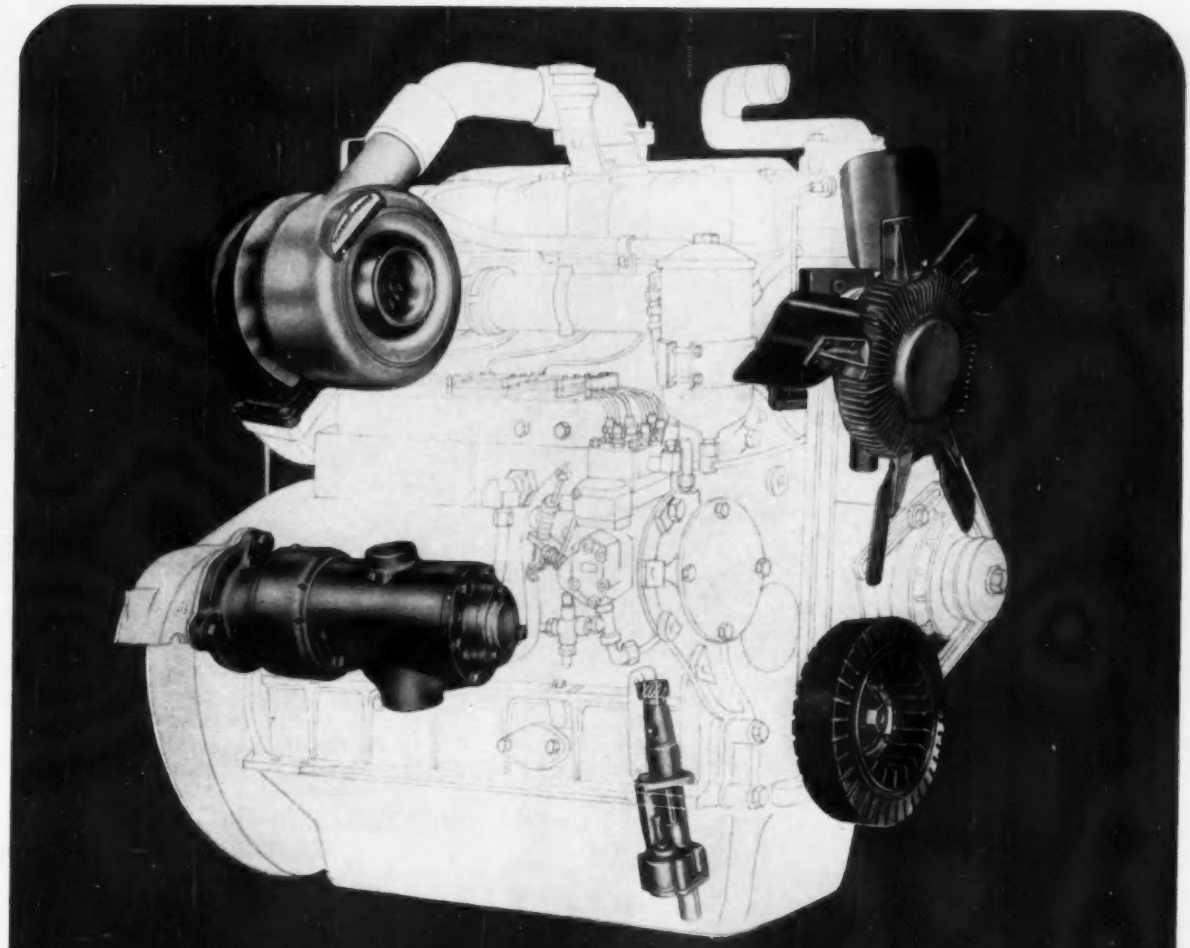
The present output shaft speed is 12,000 rpm, but interchangeable gearing will permit a wide choice of speeds. Provision for modification to a "free turbine" type engine was included in the original design for applications having heavy starting loads and variable speeds.

Mexican Passenger Planes Ready to Fly U.S. Routes

The Mexican boom in civil aviation is on as a result of the recent bilateral air agreement with the U.S. Civil aeronautics officials have designated Mexican carriers to service routes to New York, Chicago, and other U. S. cities.

Aeronaves de Mexico has the New York and New Orleans franchise, and Compania Mexicana de Aviacion will fly to Chicago and San Antonio, Tex. The latter's route to Los Angeles has also been confirmed. Aerovias Guest will operate a Mexico-Miami flight.

Mexican aviation and government officials seem confident that Mexican carriers will compete favorably with the U.S. operators on the U. S. runs.



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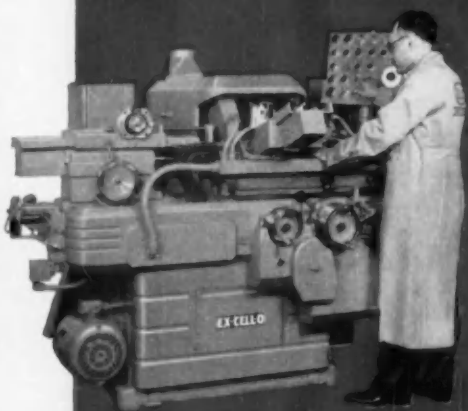
Precision Threads Roughed And Finished

Automobile steering gear ball-race screws in three stages of processing: blanks, rough-ground, and finish-ground.



Ex-Cell-O Style 33 Thread Grinder equipped to automatically grind steering gear ball-race screws.

XLO EX-CELL-O FOR PRECISION

Automatically!

These automobile steering gear ball-race screws are rough-ground from the solid on an Ex-Cell-O Thread Grinder. This operation was formerly done by thread hobbing or milling. The screws then go into the machine illustrated, an Ex-Cell-O Style 33 Thread Grinder, equipped for automation. It self-loads, locates, finish-grinds, and ejects steering gear screws. What's more, when desired, the wheel can be automatically dressed after completing a predetermined production. It increases hourly per-unit output over manually operated machines while actually decreasing the number of rejects. A double saving.

Ex-Cell-O Precision Thread Grinders come in a wide range of models—some best suited for toolrooms and short runs, others designed for fully automatic, high volume output. In all, there are five models adaptable to any production requirement.

Why not find out today how these Ex-Cell-O Precision Thread Grinders may be able to reduce your per-unit costs? For full information, just call your nearby Ex-Cell-O Representative.

EX-CELL-O CORPORATION *Machinery Division*

DETROIT 32, MICHIGAN

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Standard of the Automotive Industry

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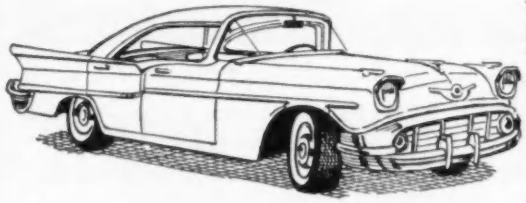
Recommended clearances for "Conformatic" pistons are from 0 to ½ thousandth inch. This clearance is maintained hot and cold providing unbelievable bore stability.



Sterling's revolutionary *Conformatic* piston already has been accepted and is now being used in a number of America's finest and most popular passenger cars.

STERLING'S CONFORMATIC PISTON WITH INTRA-CAST STEEL LINED GROOVES

prevents frictional horsepower loss, reduces oil consumption to an absolute minimum, and prolongs engine life up to 400%. *Intra-Cast* and *Conformatic* are registered trade names of STERLING Aluminum Products Inc.

STERLING

ALUMINUM PRODUCTS INC.

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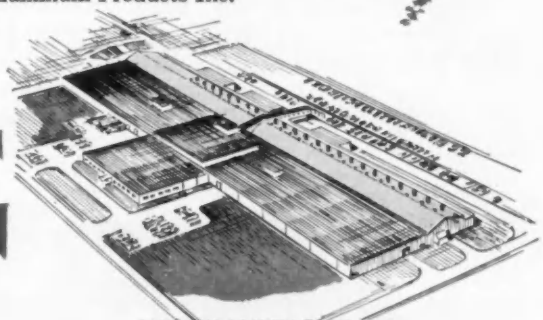

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Air-actuated, the "T" Brake operates through a precision-forged, one-piece camshaft. The cam design provides a constant, equal rate of lift to both shoes. The entire camshaft is heat treated for maximum strength.

Fabricated steel brake shoes combine strength with lightness . . . hardened spool type cam rollers used with single-web, fabricated shoes provide perfect alignment with camhead. The roller, mounted in an open-type support, is always free to rotate. Brake linings are available up to ½" in thickness.

Other features include: quick, one-point adjustment; air chamber and camshaft brackets mounted on backing plate in one compact assembly; wide range of sizes and capacities.

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Please send me further information on your "T" Brake.

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City ..... State .....

These un-retouched photographs show non-aluminized and aluminized low-alloy inlet valves after tests under similar conditions.
NOT ALUMINIZED
ALUMINIZED

For Important Savings in Your Engine Costs Use EATON Aluminized Inlet Valves

Modern high-output engines require inlet valves with superior scale resistance. Heat resistant alloys have solved this problem, but at a cost premium. Valves made of low cost materials and aluminized by the Eaton aluminizing process have corrosion resistant qualities equal to, or better than, valves made of higher priced alloy materials.

Let our engineers help you apply the cost-saving benefits of Eaton aluminized inlet valves to your engines.

Plain carbon steel valve with aluminized face after exaggerated test of 16 hours in air atmosphere at 2000°F. Note the gross oxidation of the non-aluminized stem area and the excellent condition of the aluminized seat-face and margin.

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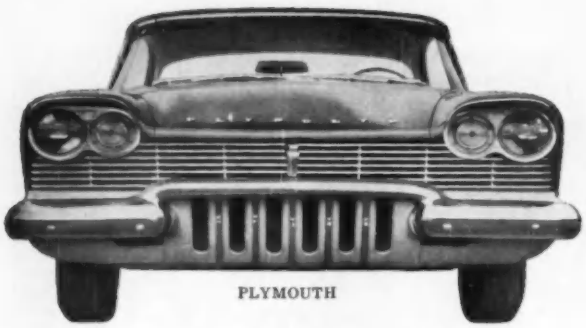
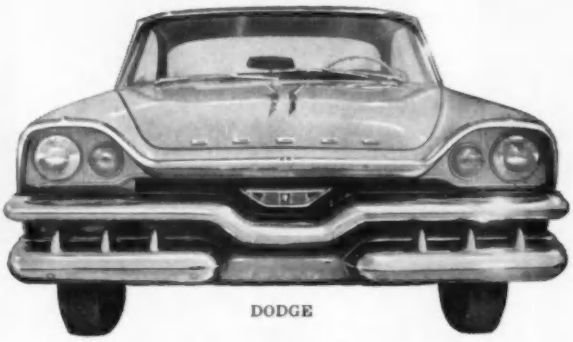


PLYMOUTH

DE SOTO

CHRYSLER



DODGE

Each one of the beautiful '57 Chrysler Corporation cars features Enjay Butyl weather-stripping on the big, wrap-around windshield and rear window. With Enjay Butyl's outstanding resistance to aging, moisture and sunlight, you can count on perfect performance for the life of the car.

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FRONT AND REAR... ENJAY BUTYL RUBBER WEATHER-STRIPPING SEALS FOR SURE!

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In more than 100 places on today's new cars, Enjay Butyl has demonstrated its profitable advantages over all other rubbers. Under the hood . . . in chassis and body... parts made from this super-durable, all-weather rubber have helped make today's new cars safer, more comfortable, and mechanically more sound. For further information, and for expert technical assistance, contact the Enjay Company.

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Enjay Butyl is the greatest rubber value in the world . . . the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

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News of the MACHINERY INDUSTRIES

By Thomas Mac New

Automatic Machine Inspects Cylinder Blocks Before They Are Machined to Eliminate Loss of Machining Time on Workpieces That Are Not Up to Standard

Automated Motor Plant

A highly automated small motor plant has been put into production by Westinghouse Electric Corp. The plant, located at Upper Sandusky, Ohio, is the newest of four fractional horsepower motor plants operated by the company's small motor division.

The one-story 66,000-sq ft plant, although highly conveyorized and mechanized, is flexible enough to permit manufacture of two basically different fractional horsepower motors; shaded-pole and permanent-split capacitor types in about 30 different styles and sizes. The plant is laid out with ample conveyor capacity to provide temporary storage between operations when necessary.

Motors in the new plant are manufactured in five basic component production lines: end bells; laminations; shafts; stators; and rotors. The motor lamination and shaft lines are completely automatic from start to finish; the other lines are highly conveyorized and mechanized.

An assembly conveyor passes the end of each component line, receiving completed parts. By the time the conveyor passes through the final assembly area, two complete sets of motor parts are on each conveyor rack.

Machine Reduces Machined Rejects

A new automatic machine, expected to cut materials waste, has been unveiled by Baker Bros., Inc. The unit, built for Cadillac, is used in the machining of cylinder blocks.

This equipment has been designed to inspect the block and set up a reference point so that the cylinders can be bored with an equal wall thickness.

If it is not possible to locate the blocks so the bores can all be made on the proper centers, then the block is automatically ejected out of the machine and automatically painted to identify it as a reject.

The cylinder blocks are fed into the machine at the left end by means of a conveyor. Once in the machine, the parts are automatically moved into the first station where two electronic probes reach into the block and automatically feel the position of the cylinder walls. These probe units are connected to an electronic computer which automatically moves the block back and forth to find the position where the wall thicknesses willl be approximately the same on all eight cylinders.

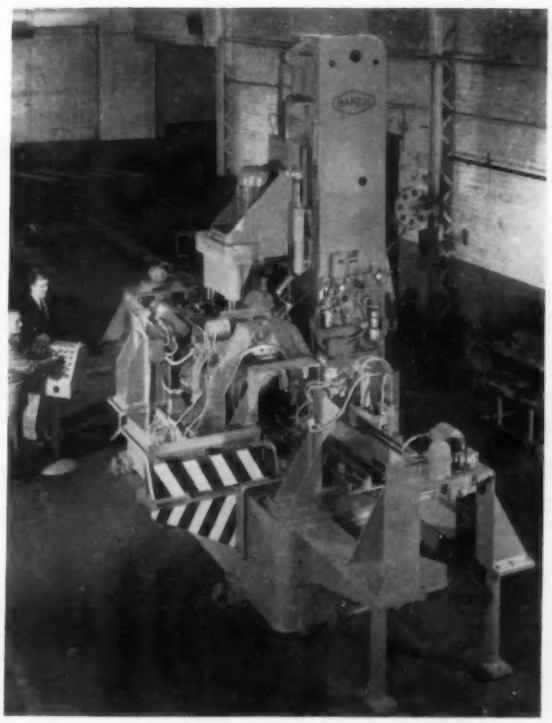
When this point is established within the limits required, two holes are automatically drilled and reamed in the block. These manufacturing holes serve as the reference point from which cylinders are finally bored.

When the holes are completed, the block is automatically moved to a "turnover" station. It is then passed out of the machine for subsequent machining operations. The locating operation on the Baker machine is done from the bottom.

To eject an unusable part, it is pushed onto a turntable which turns the block 90 deg and pushes it out onto a second conveyor. At this point an automatic paint gun sprays the block so that it can be identified as a reject.

The machine utilizes a static switch type electrical control system.

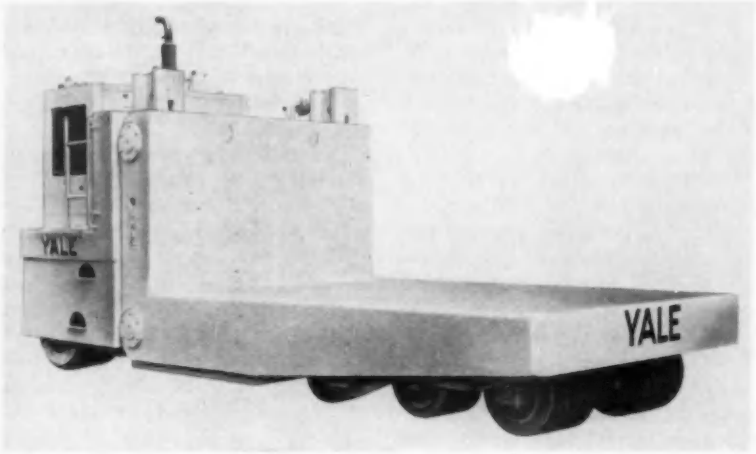
(*Turn to page* 117, *please*)



Baker Bros. automatic machine for Cadillac engine production inspects cylinder blocks prior to machining operations

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89



Yale lift truck, designed for handling large dies, has 200,000-lb capacity

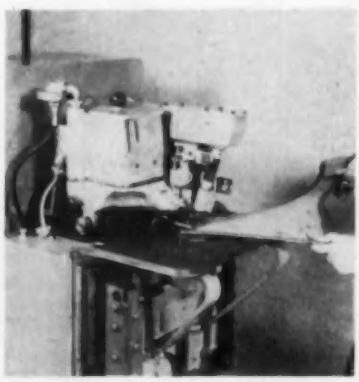
High-Capacity Industrial Truck for Die Handling

COMPLETION of what is said to be the world's heaviest-capacity industrial lift truck, a Diesel-electric platform model, has been announced. It is capable of carrying loads up to 200,000 lb, and was designed for handling huge dies in expediting their transit between outside storage and inside presses.

Total weight of the unit is 77,000 lb, and it is 21 ft 4 in. long. Its die-carrying platform measures 13 by 8 ft. The truck is arranged to provide 2 ft 4 in. of lift, which is accomplished by hydraulic means.

The Diesel-electric vehicle is powered by an International Harvester engine. The generator produces 35 kw normal to 47.5 kw maximum output. Driving force is delivered to the four 36 by 16 in. drive wheels by two electric motors. Steering is hydraulically-powered through eight sets of swiveling wheels. *The Yale & Towne Mfg. Co.*

Circle 30 on postcard for more data



Kamborian edge folding machine

Upholstering Machine

DEVELOPED for use in fabricating panels, a new machine known as the Kamborian Edge Folder stretches material over one surface of a form, cementing the marginal portions to the reverse side in one operation. Using thermoplastic cement which is fed automatically under controlled temperature to the operating head, the machine is said to perform the upholstering operation as fast as material can be fed by the operator. It is stated that pilot studies are currently being undertaken with automotive and aircraft parts manufacturers, particularly in door panel work.

Folding and sealing operations are made quickly by the use of patented knurled feed gears and automatic folding and cementing controls. Fast operation, uniform high quality, elimination of pre-cementing operations, and savings in material are among the benefits claimed for this machine. *Kamborian Products, Inc.*

Circle 31 on postcard for more data

Paint Agitator

TO prevent off-color when using the new OA or acrylic lacquers, an air-driven agitator siphon cup has been introduced. It thoroughly mixes the paint materials and prevents settling when spray equipment is not in use.

The agitator is powered by an air-operated variable-speed drive unit which actuates the agitator paddles inside the one-quart cup when it is placed on the power unit. The unit is available in one or five-cup models. *Binks Manufacturing Co.*

Circle 32 on postcard for more data

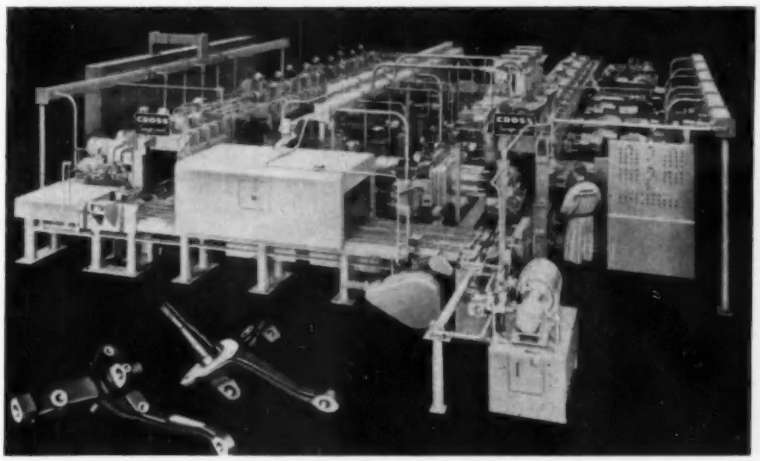
Cutaway view of Binks agitator siphon cup showing chain drive unit and agitator blades. When siphon cup is placed on drive unit, blades revolve to mix paint.

Transfer Machine Processes Integral Spindles, Steering Arms

INTEGRALLY-FORGED front wheel spindles and steering arms are being machined on a new Transfer-matic recently announced. The machine processes right and left-hand spindles together, so that a car set is completed with every machine cycle. Rated capacity of the machine is 144 right and 144 left-hand parts per hour at 100 per cent efficiency.

Operations performed are: (1) straddle mill the upper and lower support arm bosses; (2) straddle mill the steering arm boss; (3) mill the steering arm stop pad; (4) mill the spindle keyway; (5) drill and taper ream the upper and lower support arm holes and the steering arm hole; (6) drill, ream, chamfer and spotface the two brake mounting plate holes; (7) drill, counterbore, spotface, chamfer and ream the brake anchor hole; (8) drill the spindle cotter pin hole; and (9) thread the wheel spindle. The wheelbearing diameters are turned and ground in pre-conditioning operations for the Transfer-matic.

Parts are carried by pallet-type workholding fixtures, which are transferred through the machine's 17 stations. A pushbutton-operated power wrench clamps and unclamps the parts in the pallet fixtures.

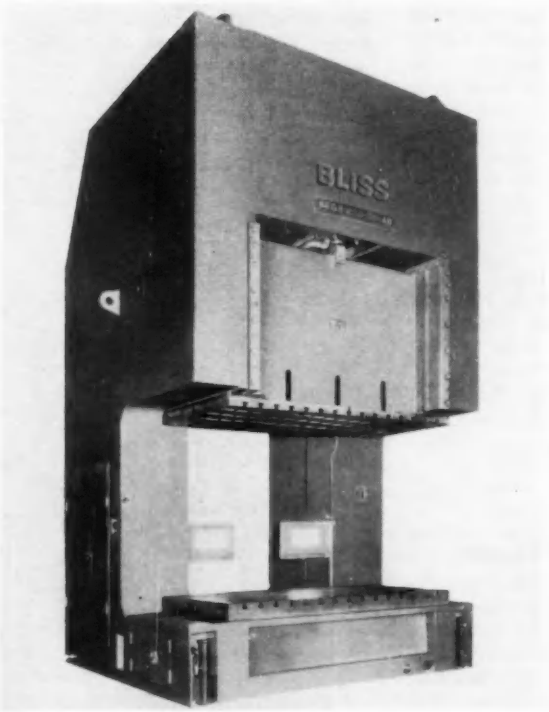


Cross Transfer-matic machines integral front wheel spindles and steering arms, performing 80 operations at 17 stations. Rated output is 288 parts per hour at 100 per cent efficiency. "Building block" construction is a feature.

The machine is built on the Cross "building block" principle for simplifying and speeding up model changes. Other features include: construction to JIC standards; hardened and ground ways; hydraulic feed and rapid traverse for milling, drilling and reaming; individual lead screw feed for threading; and automatic fixture cleaning unit. *The Cross Co.*

Circle 33 on postcard for more data

Gap Frame Press Exemplifies Packaged Design



Made for piercing rear fenders, this custom gap frame press, one of two built, is a 200-ton eccentric driven, single action unit with one-piece frame and built-in accessories. Among its features are pneumatic friction clutch and brake, slide arranged for three-bar knockout, electric pushbutton control, stroke indicator, die cushions, die lights, safety jacks, and rotary synchronizing switch. Automatic filtered oil lubrication is provided. It is said to exemplify the company's use of "packaged" design in meeting users' needs, enabling presses to be built with shafts front to back or left to right, with lubrication built in or not built in, and either single or double geared. (E. W. Bliss Co.)

Circle 34 on postcard for more data

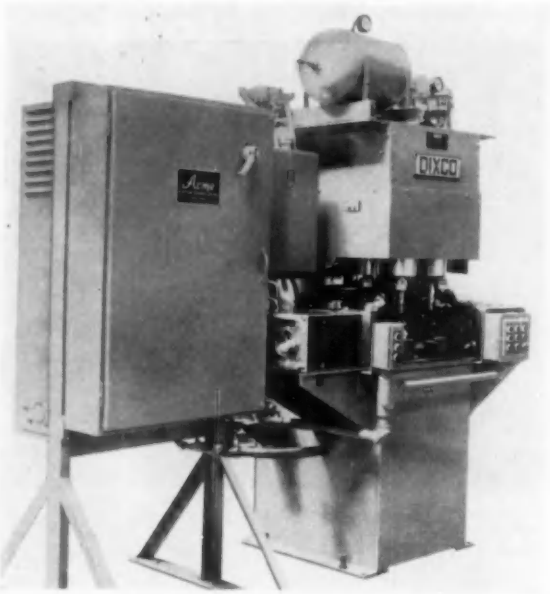
Fixture Power Unit

NOW available from the Beckett-Harcum Co. is a simplified but complete fixture clamp power package known as the Valve-N-Cylinder. The unit, which can be used for clamping, locating or push-off of parts on production operations, consists of a square rod (non-rotating) air cylinder on which is mounted a new type electric three-way valve. The valve is compact, fast-acting, and is easily connected into electrical sequence circuits. Foot, hand or limit switches may be used to energize the valve. Valve current characteristics are 110 or 220 v, 60 cycles. The non-rotating cylinder rod eliminates the need for slides or guide rods.

The valve is easily removed from the cylinder, leaving a standard pipe port exposed in the cylinder. Thus the valve and air cylinder may be used separately, or the unit can be reassembled in a few minutes. Split block mountings allow adjustment over the length of the cylinder without removing the unit from the fixture. The unit is available with 1, 1½ and 2 in. bores; 1, 2, 3 and 4 in. strokes.

Circle 35 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT



Dix automatic projection welder designed for welding four studs simultaneously to converter cover of automatic transmission. Rated output is 180 welded parts per hour at 80 per cent efficiency

Stud Welder Tailored to Boost Efficiency

EVOLVED to improve the efficiency of manufacturing an automatic transmission component, the automated four-stud projection welder pictured was custom-made for a leading automobile manufacturer and is one of two to be used. It was developed to meet a production need that arose when the car maker changed the design of the converter cover. The new design welds the studs to the cover rather than mechanically locking them. This technique saves a number of machining operations required by former methods, thereby reducing the cost of the part.

A stated feature of the welder's performance is its ability to hold the close tolerances required. Location of the four studs is held to ±0.012 in. between centers. Another feature is an automatic unloading and part turnover device which feeds the complete welded part to the inspection station prior to machining.

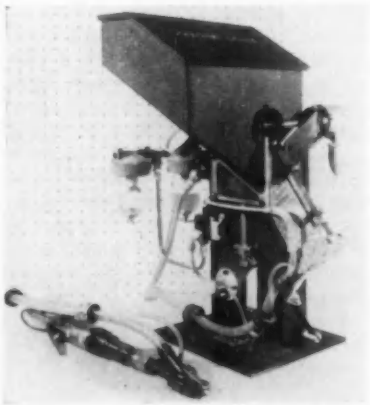
Operation of the machine is automatic following manual loading of four studs in the lower electrode and placing the stamping in the holding fixture. Rated output is 180 welded parts per hour at 80 per cent efficiency. For protection of the threaded stud, the welder incorporates Nylon protection strips wherever the threads would normally contact metal.

The machine is rated at 260 kva employing four 65 kva resistance welding transformers at 440 primary input voltage. *Dix Engineering Co., Inc.*

Circle 37 on postcard for more data

Fastener Feeder

SCREWS with pre-assembled washers, such as lockwashers of an internal tooth, external tooth or spring type and plain or spanner type washers, may be fed continuously to portable drivers by an automated fastener feeding unit recently demonstrated.



Pneuma-Serve model PS-5B screw feeder

Called the Pneuma-Serve PS-5B, it incorporates a new selective release mechanism which controls the entry of fasteners into the delivery tube. Oversize or misshapen screws that might otherwise cause jamming in the unit's head are prevented from entering the plastic delivery tube by this mechanism. After the screws in the large storage hopper have been guided in to the gravity flow track by the nylon-brush motorized deflector, each fastener in turn passes into a sizing tube at the base of the track and moves through it unless it is oversize or malformed. In the latter case the fastener is trapped and ejected by pressing a rejector button that activates a pneumatic blow-out mechanism. The rejector button can be mounted on the base of the hopper, as shown in the illustration, at any bench position, or on the barrel of the driver itself. *Geo. A Tinnerman Corp.*

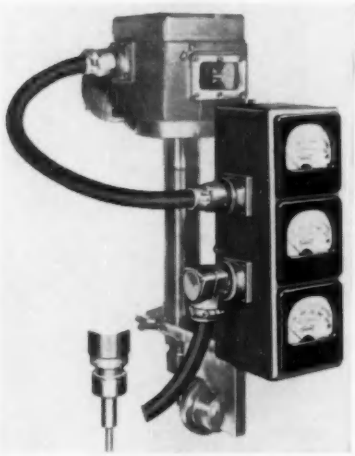
Circle 36 on postcard for more data

Tracer Attachment

THE visual indicator setup attachment illustrated has been announced by the manufacturer of Duplimatic tracer control devices for controlling operations of machine tools. It mounts on the tracer unit head and gives the setup man an individual visual reading on each of the three movements of the stylus, speeding setup and assuring accuracy. Meter calibrations are in milliamperes.

The unit may be installed on Duplimatics now in the field, as well as on new machines. *Tracer Control Co.*

Circle 38 on postcard for more data



Tracer Control setup attachment

Gear Gaging Unit

FOR use in automated production lines a new Model GRF Red Ring pedestal-type gear gaging, sorting and machine tool control unit is now available. The unit can be adapted to check size and helix angle accuracy of spur or helical gears. A model for hobbing machines checks and sorts gears for both size and helix angle accuracy. Another model for gear shapers and shaving machines checks and sorts gears for size accuracy only.

The gaging machine consists of a motorized gaging and sorting unit through which the gears are fed one at a time from an inclined feed chute. Gears that pass inspection travel through the machine into an inclined exit feed chute. The machine is supported by a cast iron pedestal base and a tubular steel column designed

Red Ring Model GRF pedestal-type gear gaging, sorting and machine tool control unit for automated production lines

to occupy a minimum of floor space. Vertical height adjustment is provided by a threaded spanner nut arrangement on the column support.

The gaging unit has a motorized lower master gear and a non-rotating upper master gear through which the production gears are passed for the gaging check. The upper master gear is pivoted in two planes, to assure accurate size check without helix angle interference. Another feature of the gaging unit is ability to rotate the upper master gear from one fixed position to another, thus permitting adjustment for wear without replacing the gear. The use of a non-rotating upper master gear also eliminates gaging problems that could result from spacing or runout errors. An anti-jamming slip clutch in the drive mechanism for the lower rotating master gear automatically remeshes any gear that does not initially engage the master gears correctly.

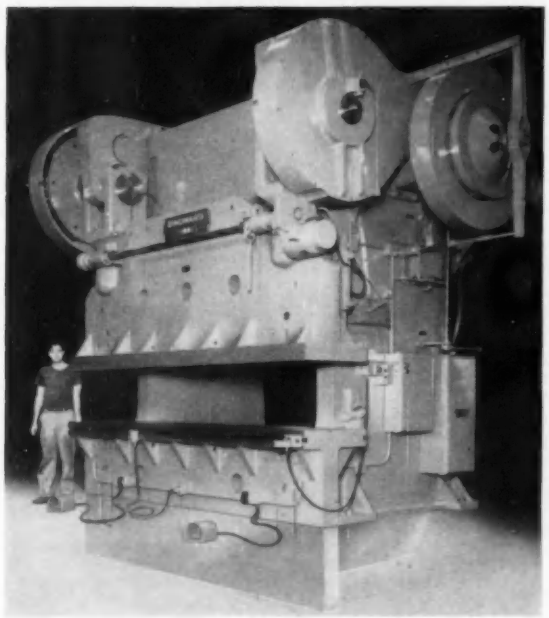
Separate electrical controls for the unit can be mounted at any desired location. Reject pans for gears that do not pass size or helix angle specifications are under the gaging machine. The unit automatically shuts down the gear production machine whose output it is gaging after a predetermined number of reject parts are detected. It can also be used as a feedback control unit to automatically shift hobs on hobbing machines when measurements indicate dulling of the tool. *National Broach & Machine Co.*

Circle 40 on postcard for more data

Press Brake Provides for Corrugating Dies

The Cincinnati 40 Series press brake shown is 8 ft 6 in. between housings and has an overall die surface of 12 ft. Both bed and ram are widened to 28 in. for mounting heavy corrugating and punching dies. Stroke is 8 in. and shutheight is 22 in. The machine is equipped with a power take-off from the main shaft for driving automatic feeding and withdrawal units. Other features include air-electric clutch control and all-steel, interlocked construction. Two-speed, totally-enclosed transmission permits operation at 5 or 20 spm. (The Cincinnati Shaper Co.)

Circle 39 on postcard for more data

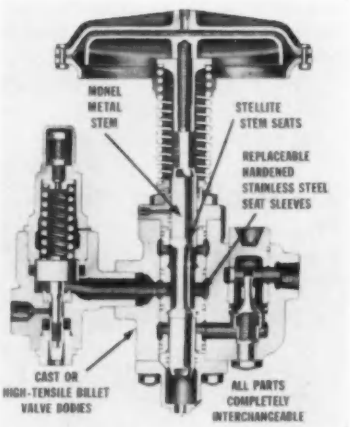


Control Valves

DIAPHRAGM-OPERATED high-pressure control valves, designed for automated control, are in a line recently announced. Suitable for use in oil, air, steam, and hot or cold water service at pressures up to 6000 psi, they are said to offer design and construction features which give superior performance.

Resistance to corrosion is obtained by the Monel metal valve stem, hardened stainless steel seat sleeves, and valve bodies of cast Navy M bronze or high tensile alloy billet bronze. Stellite seats are electro-bonded to the Monel stem, and stainless steel seat sleeves are easily replaceable. Interchangeability of parts for simplifying maintenance is also featured. *Sinclair-Collins Valve Co.*

Circle 41 on postcard for more data


MONEL METAL STEM
STELLITE STEM SEATS
REPLACEABLE HARDENED STAINLESS STEEL SEAT SLEEVES
CAST OR HIGH-TENSILE BILLET VALVE BODIES
ALL PARTS COMPLETELY INTERCHANGEABLE

Cutaway view shows features of Sinclair-Collins valves. A two-pressure hydraulic operating valve, with automatic high pressure inlet valve, is shown.

NEW PRODUCTION and PLANT EQUIPMENT

Allis-Chalmers Model FT-100 heavy-duty 10,000-lb capacity lift truck, available with Diesel, gasoline or LP-gas engines. Overhead guard rail and headlight on the LP-gas model shown are obtainable as optional equipment.

New 10,000-Lb Lift Truck Added to Line

PRODUCTION of a new addition to the Allis-Chalmers' material handling line, a 10,000-lb capacity lift truck called the FT-100, has been announced. It is designed for heavy-duty work characteristic of steel mills, factories and warehouses where heavy loads have to be handled.

The FT-100 has a heavy, welded industrial-type frame. The 230 cu in. Allis-Chalmers engines are available in Diesel, gasoline or LP-gas fuel models. An easy-shift, two-speed, constant mesh transmission is provided. Power shift transmission, power steering, and a no-spin differential are available as optional equipment.

A new roller type extra-lift mast that gives more lift without increasing the overall lowered height of the unit is obtainable in three standard heights. The standard ITA shaft-type fork mounting carriage permits the use of a range of standard attachments, plus those built to order for specific needs.

Other features of the FT-100 include: fully adjustable operator's seat; one-lever gearshift located on steering column; lift and control levers within easy reach to the right of operator; full-floating hydraulic service brakes; cam-action over-center type parking brake; and accessibility of components for servicing. *Allis-Chalmers Mfg. Co.*

Circle 42 on postcard for more data

Repulsion-Start Motors

REPULSION-START induction single-phase motors, in integral four-pole ratings one through five horsepower, are now being built in new NEMA frames 182 through 254U. Placing these motors in the new frames, making them interchangeable with capacitor-start and small poly-phase motors of the same ratings, was accomplished without changing their electrical characteristics.

This type of single-phase motor is said to be used especially on applications with heavy starting duty requirements, because of its ability to repeatedly start heavy loads with low current and minimum line drop. *Wagner Electric Corp.*

Circle 43 on postcard for more data

Magnaflux Accessory

A NEW, low-cost permanent magnet "leech" now enables one man to perform Magnaflux and Magnaglo testing operations. The No. 54975 Leech consists of a permanent alnico magnet, cast steel pole pieces with an aluminum carrying handle, and five feet of 2/0 cable. It will remain and make electrical contact as long as desired on any magnetic surface, including vertical and overhead members. The magnetizing source may be ac, dc, or half-wave current, not exceeding 1500 amp. *Magnaflux Corp.*

Circle 44 on postcard for more data

D-C Load Meter

PRIMARILY designed for use on machine tools powered with direct current, where tool wear indications and power readings are desired, a meter just introduced features provision for variable range calibration. Called the Model L-122-DC Loadmeter, it is made in standard ranges from 9 to 45 and 25 to 150 amp. Special d-c meters in amperage ranges from 0.3 to 450 amp are available. The amperage range is changed by hand adjustment of the calibrator. This makes it possible to use the meter on several types of machines, or to change the amperage range for particular work applications.

Other stated features of the instrument include all-steel box, JIC and NEMA approved; cushioned sapphire jewels to absorb vibration and shock; calibrated dial in per cent of load with graduated colors; accuracy under full or partial loads; and use of variable length motor leads without affecting calibration, as high voltage leads are not taken to the meter. *Futurmill, Inc.*

Circle 45 on postcard for more data

Futurmill Model L-122-DC Loadmeter has variable amperage range

Huge Segmented Transfer Machine Line Processes Intake Manifolds

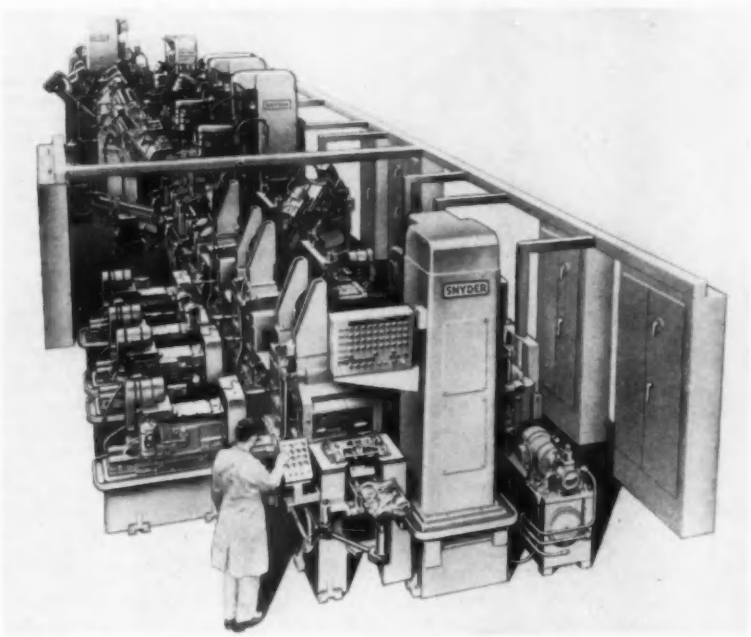
AN unusual 175-ft long segmented transfer machine line that machines automotive engine intake manifolds completely from rough casting to finished part has been designed and built by Snyder Tool & Engineering Co. Either two or four-barrel carburetor manifolds can be fed into the line at random. Built-in sensing devices automatically shift heads at three stations to provide the required machining operations. No idle stations are necessary to permit the processing of the two different parts.

The new line, which produces parts at a net rate of 136 manifolds per hour, is actually three individual transfer machines that add up to a total length of 230 ft. To put the processing line in the required 175-ft long factory space, Snyder engineers devised a method of operating two 29-station, 72-ft long transfer milling machines in parallel (side by side), and feeding their output through automation devices to a third 32-station, 86-ft long transfer drilling machine. The huge processing line removes about 18 lb of metal from each 70-lb intake manifold and makes 2450 lb of chip per hour. More than 5400 lb of parts are in continuous process in the machining line.

The first two transfer machines in the line, which perform essentially milling operations, are duplicates of each other. The automation devices between the two parallel transfer machines and the succeeding drilling transfer machine feed manifolds alternately from the milling machines based upon the demand of the drilling machine. An automatic part-positioning device operated by the transfer mechanism of the drilling machine automatically turns the manifolds 90 deg as they enter the machine. At one of the tapping stations in this machine, drilling and tapping heads are automatically shifted according to the two or four-barrel carburetor mounting surface hole requirements.

Snyder standard machining units with hardened and ground ways are utilized throughout the transfer machines. Each of the milling transfer machines has six standard way-type machining units powered by standard external hydraulic power units, and eight standard self-contained machining units. The drilling machine has 18 standard self-containing units and 11 way-type machining units.

All tapping spindles in the three transfer machines have individual lead-screw drives. Automatic lubricating systems are provided throughout the transfer machines. The entire transfer line is made up of a series of individual segmented machines, each segment having its own control panel and capable of individual operation. Walking-beam type transfer mechanisms move the manifolds through the three machines. The entire machining line is hydraulically-operated and electrically-controlled with JIC standard components.



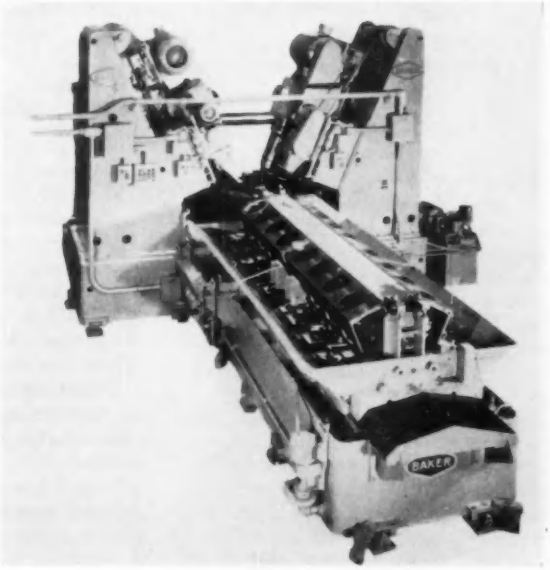
The 86-ft long drilling section of the Snyder transfer machine line that machines intake manifolds from rough castings to finished parts

Circle 46 on postcard for more data

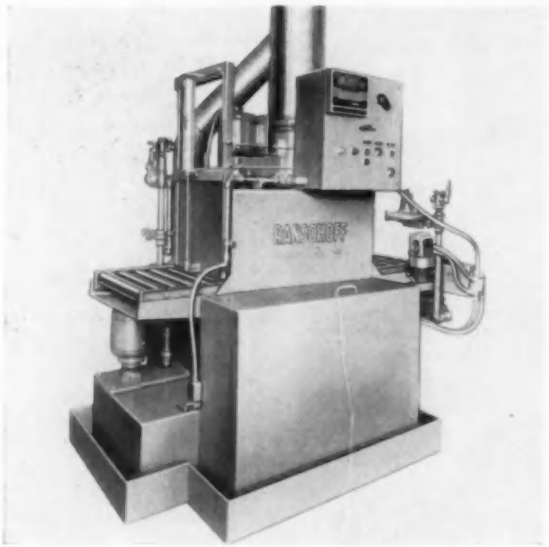
Unit Automatically Machines Cylinder Blocks

This Baker special tool rough and finish-bores and spotfaces welded steel Diesel engine cylinder blocks to take cylinder sleeves. The part automatically indexes on the shuttle table, and the cycle is automatic. Standard components are used wherever possible. Boring and counterboring of the sleeve holes are performed by two 2050 basic slides with 5-hp bevel gear drives Two 115 basic slides with 5-hp bevel gear drives drill dowel pin holes. The machine is designed for 16, 12, 8 or 6 cylinders. (Baker Brothers, Inc.)

Circle 47 on postcard for more data



NEW PRODUCTION and PLANT EQUIPMENT



Cabinet type inter-process washer for on-the-spot cleaning between machining operations. Initially built by Ransohoff, Inc. for removal of chips and cutting oils from machined automatic transmission parts prior to succeeding machining operations, it also has application wherever washing of an intermittent flow of parts is desired, or can be used between departments to supplement central cleaning equipment.

Washer for Inter-Process Cleaning

THE single stage inter-process washer illustrated was designed by engineers of a leading automobile manufacturer and built in a lot of 10 by a company specializing in the field. Each is installed between machining operations in a plant producing automatic transmissions. Work performed is the removal of chips and cutting oils from machined parts to assure accuracy of succeeding operations.

In operation, parts on the roller conveyor, on fixtures or in baskets are loaded into the cabinet. Vertically sliding air-operated doors at both ends of the cabinet are closed by manual operation of the control valve lever located at the loading end. When the doors are closed, the pump is started and the parts are subjected to spray action cleaning with a heated recirculated washing solution. After the washing period, the doors are opened and a valve in the solution line leading to the sprays is closed, automatically cutting off the spray. The parts are then removed at the unloading end, and the next parts to be cleaned are loaded at the loading end and the cycle repeated.

The solution tank is heated by an atmospheric gas burner burning into submerged gas flues. Tanks can be designed for steam or electric heating as desired. *Ransohoff, Inc.*

Circle 48 on postcard for more data

Hard Metal Drill

THE new K-Matic positive feed air drill, recently introduced, is now available with 4 in. stroke and feed rates of 4, 6, 8 and 10 thousandths per revolution for drilling and reaming hard metals. Reports on initial applications indicate that its positive feed feature, which avoids work hardening, is best utilized when drilling holes in large titanium and stainless steel aircraft parts.

The K-Matic is basically a portable tool that hangs by its nose to a jig or fixture by means of a quick-locking drill bushing tip. A 30 deg turn locks the tool in position to absorb both the torque reaction and thrust of drilling. The drill develops up to 1000 lb of thrust, and is used generally for drilling aluminum alloys, titanium or heat-treated stainless and alloy steels.

The drill bit automatically returns at the end of each stroke. In case of bit failure at any part of the stroke, the instant-return feature prevents further damage, it is pointed out. The offset drill handle can be adjusted to any radial position desired in relation to the attachments.

According to company engineers, the drill has also been used to advantage in automatic machining fixtures, where a number of tools are mounted around a turntable for progressively drilling, reaming and tapping a series of holes. *Gardner-Denver Co.*

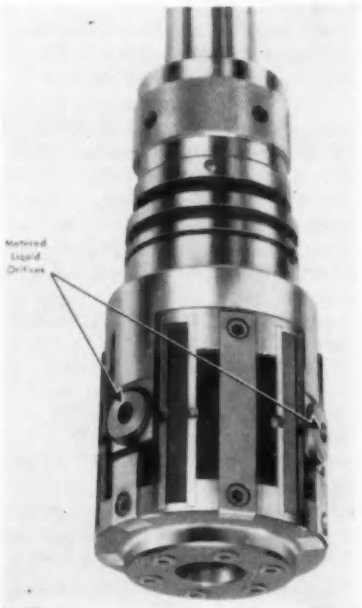
Circle 49 on postcard for more data

Honed Bore Sizing

LIQUID SIZING is the designation for a new method for sizing honed bores as part of the honing cycle. The process automatically gages the diameter of honed bores throughout their full length as the honing progresses.

Sizing is accomplished by metering liquid coolant, under pressure, to the cylinder wall through orifices in the honing tool, until a preselected pressure drop-off point occurs. As the honing advances and the bore increases to the desired size, this causes the liquid pressure (to the tool) to drop. When the preselected pressure level is reached (bore to size), a microswitch then terminates the honing machine cycle, permitting the tool to complete its stroke and withdraw from the bore.

This method is said to offer several advantages not found in other methods of gaging honed bores. Coolant is flooded over the cylinder walls at the most critical points during the honing cycle, effecting better heat control. It also provides continuous flushing which increases stone life and gives better microfinish control. New BarnesdriL plate-type honing tools, constructed for low tool maintenance and to facilitate stone replacement, are also utilized. *Barnes Drill Co.*



BarnesdriL plate-type honing tool showing orifices through which liquid coolant is metered in Liquid Sizing

Circle 50 on postcard for more data

Magnetic Motor Starter Has Design Innovations, Reduced Size

MATERIALLY different in design, a new NEMA Size 0 and 1 magnetic motor starter just introduced is of "snap-slide" construction. Principal components snap or slide together for quick inspection and maintenance. Size of the unit is 42 per cent smaller than previous open forms.

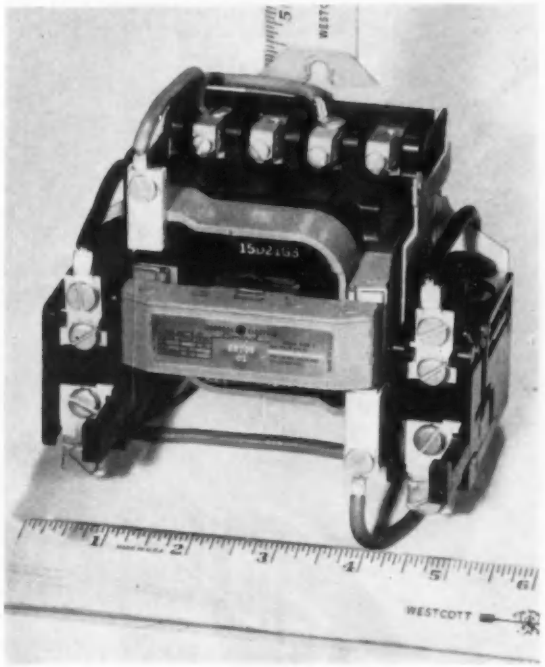
The starter can be taken apart for routine inspection without using a single tool. The wrap-around cover, which is secured to the enclosure with a spring-clip latch, slides off easily. Each coil terminal is unclipped with one motion permitting the magnet, coil, arc chute cover, and movable contact arm to come out as one assembly. After the armature spring clip is removed, all of these components can be separated.

Dust collection on contact surfaces is minimized by the use of new vertically-slanted contacts. The wedge-shape of the contacts, design of the base support, and horizontal closing motions reduce bounce, give higher contact tip pressure, and lessen the chance of contact welding, according to company engineers. Contacts can be changed from normally open to normally closed without extra parts. A machined air gap, low flux density and smaller size of the new magnet contribute to positive drop-out for the life of the starter.

By turning a knob on each of the two overload relays, the overload trip setting can be adjusted up to ±15 per cent of nominal heater rating. This permits quick adjustments to meet special application needs such as in areas with varying temperatures. A new "strongbox" coil that requires a lower inrush current, makes possible the use of a 47 per cent lower rated control transformer than with previous starters.

The new starter can be mounted in any position, a screwdriver being the only tool necessary for installation. All wiring can be done from in front; and even though the starter is smaller, the new enclosure has 32 per cent more wiring space. Removable enclosure sides also assist wiring. Leads go directly to all line terminals at the top and from all load terminals at the bottom, with no wires running along the side of the starter.

Nine field modification kits are available for the starter. A pushbutton or selector switch, third overload relay, up to three auxiliary contacts, or a differently rated coil can be added within the same enclosure. Fuse clip kits are also available for combination forms. Three of the modification kits are new. One is for mounting an indicating light in the cover to provide indication of starter operation. Another kit is for adding an auxiliary pole in the field. An adapter plate is the third kit, permitting interchangeable mounting with previous starter forms.



New NEMA Size 0 and 1 magnetic motor starter, developed by General Electric, is 42 per cent smaller in area than previous open forms. Open form measures 4½ in. high and 5-3/32-in. wide. Enclosed form is 7¼ in. high, 6½ in. wide, and 4⅝ in. deep. A major feature of the design is "snap-slide" construction which provides easy inspection and maintenance because principal components snap or slide together.

Magnetic tarters in the "100 Line" series are designated CR-105, CR-106, CR-107, CR-108, CR-109, CR-110 and CR-111. Built to new NEMA ratings, the units are obtainable in Size O rated up to five horsepower at 440-v and Size 1 rated for 10 hp at 440-v. They come in contactor, non-reversing, combination, reversing, and multi-speed forms. *General Electric Co.*

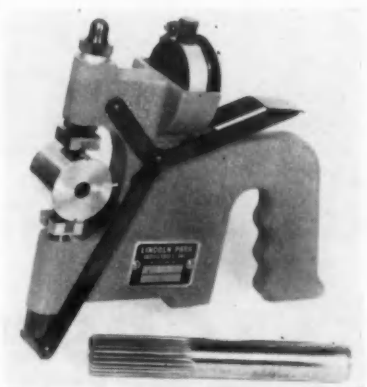
Circle 51 on postcard for more data

Snap Gage

THE main feature of a new dial indicator snap gage is its retractable anvil that results in faster operation and more pieces checked per hour. Since the gage is portable, it can be used to inspect work at the machine, as well as in the quality control section. Design of the instrument is said to assure positive alignment and squareness. There are no pivots, bearings or cams in its internal construction; and the only wear points are on the carbide anvils and in the indicator. It is available in size ranges from ¼ to 5 in., with anvils furnished to suit the application.

The gage illustrated is shown being used to check the rolled spline of a shaft, with a master setting gage in place along with a section of the splined shaft. Another application is in checking gear tooth pitch diameters. *Lincoln Park Industries, Inc.*

Circle 52 on postcard for more data



Lincoln retractable anvil snap gage

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FREE LITERATURE

Grinding Wheels 1

Publication PG-320 is a new booklet which describes a line of grinding wheels and gives helpful information concerning their proper use and application. *Cincinnati Milling Products Div.*

Tape Instrumentation 2

"Magnetic Tape Instrumentation" is the subject of 15-page presentation 4-57 which outlines the application of magnetic tape recording in automotive and aircraft product development and machine tool work. *Ampex Corp.*

Heat Treating Units 3

A 12-page catalog features equipment ranging from high-vacuum furnaces to automatic conveyor, rotary and shaker hearth, and large brazing units. *Pacific Scientific Co.*

Electroplating 4

A 12-page booklet pointing out nine ways to cut electroplating costs has been issued by *The Diversey Corp.*

Drilling Machine 5

Catalog 357, 12 pages, describes a new machine for heavy-duty drilling, reaming, spotfacing, boring and counterboring, milling, and chamfering that can be mounted horizontally, vertically, or on an angle. *Avey Div., The Motch & Merryweather Machinery Co.*

Pillow Blocks 6

A 10-page catalog listing a line of ball-bearing pillow blocks includes construction features, dimensions, load ratings, and mounting data. *New Departure Div., General Motors Corp.*

Industrial Trucks 7

Fork-lift trucks, straddle carriers, powered hand trucks, and towing tractors of an entire line are described in a 16-page catalog which includes complete specifications. *Industrial Truck Div., Clark Equipment Co.*

Tubing 8

Reprint article, "What to Check When Specifying Hydraulic Tubing," explains how to specify tubing to obtain leakproof hydraulic systems. *Superior Tube Co.*

Hardness Tester 9

A portable tester that can be used in any position to test the hardness of any size, shape, or type of metal is covered in a four-page folder issued by *Newage Industries, Inc.*

Wheel Dresser 10

Four-page folder T-244 describes the features of a machine that will do precision dressing of grinding wheels to various forms. *Threadwell Tap & Die Co.*

(Please turn page)

VOID After Oct. 1, 1957 8/1/57

Circle code numbers below for Free Literature, New Plant Equipment, or New Product Information

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High-Strength Alloys 11

The physical properties, applications, and shape availability of four wrought high-temperature alloys are listed in Booklet DB-52-250, four pages. *Westinghouse Electric Corp.*

Hardness Tester

Pressure Pickup 12

A pressure pickup, which is furnished in differential and gage models and is capable of continuous operation at 600 F, is described in Bulletin 1568-A, two pages, issued by *Consolidated Electrodynamics Corp.*

Bimetal Thermostats 13

Bulletin 8400, four pages, gives the temperature ranges, ratings, mountings, and terminal arrangements of various types of bimetal thermostats. *Stevens Mfg. Co., Inc.*

Plastic Linings 14

Booklet 171-77, 18 pages, gives detailed information on a flexible thermoplastic, chemical-resistant lining for storage and processing tanks, medium to large diameter pipes and fittings, fume ducts and hoods. *The Dow Chemical Co.*

Heating Elements 15

Catalog M-55D, 12 pages, describes a nickel-chromium-iron heating element alloy designed for use in controlled-atmosphere furnaces operating at temperatures up to 1800 F. *Hoskins Mfg. Co.*

USE THIS POSTCARD

Machine Tools 16

A series of six bulletins on special-purpose machine tools includes descriptions of a bearing preload and torque testing machine, three types of transfer machines, an automatic forming and welding machine, and an axle drilling machine. *Standard-Modern Tool Co. Ltd.*

Tubing 17

ASL 288, five pages, provides latest technical data on the high-temperature properties of a heat-resistant alloy used for tubing. *Tubular Products Div., The Babcock & Wilcox Co.*

Conveyor Furnace 18

Bulletin 464, four pages, describes an electrically heated conveyor-type furnace designed for the bright heat treatment and copper brazing of stainless steels, and for some high-temperature nickel-alloy brazing applications. *C. I. Hayes, Inc.*

Self-Locking Nuts 19

Bulletin 5711, 36 pages, presents information on miniaturized self-locking nuts for electronic units and avionic equipment, and includes standard drawings on miniature hex, clinch, fixed, and floating anchor type nuts. *Elastic Stop Nut Corp. of America.*

Hydraulic Pumps 20

Bulletin A-5216, four pages, covers hydraulic pumps and motors, motor-pumps, and hydraulic packages, miniaturized especially for missile applications. *Vickers Inc.*

Flow Meters 21

Bulletin 110, four pages, lists a line of flow meters and gives their pressure and temperature ratings, as well as flow capacity ranges. *Brooks Rotameter Co.*

Alloys 22

A 104-page booklet gives up-to-date information on four nickel-base corrosion-resistant alloys, and describes techniques for forging, cold working, grinding and welding them. *Haynes Stellite Co.*

Shaving Machine 23

Bulletins S-57-2, four pages, covers the basic design features of a diagonal gear shaving machine, and includes specifications for the 8-, 12-, and 18-inch models. *National Broach & Machine Co.*

VOID After Oct. 1, 1957 **8/1/57**

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XXII

This is the twenty-second of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Normalizing Alloy Steels

There are several forms of heat-treatment commonly employed in the processing of alloy steels. Each in its own way modifies the mechanical properties and structures of steel, and each is chosen with a definite objective in mind. The five usual forms of treatment are normalizing, annealing, spheroidize-annealing, quenching and tempering, and stress-relieving.

In this particular discussion, let us consider briefly the purposes and effects of normalizing.

Normalizing is an operation in which the steel is heated to approximately 100 deg F above the upper transformation range, then cooled in still or agitated air. The basic purpose is to refine the prior structure produced by variations in finishing temperatures encountered in rolling or forging. The structure resulting from normalizing, being more uniform, will help create improved mechanical properties when the steel is subsequently reheated, liquid-quenched, and tempered.

There are times when large steel parts (heavy forgings, for example) cannot be liquid-quenched because of their size. In cases of this nature, the heat-treatment must consist of single or multiple normalizing followed by tempering.

High-temperature normalizing is sometimes used for grain-coarsening low-carbon alloy steels to promote machinability. (In high-temperature normalizing, steel is heated to more than 100 deg F above the upper transformation range.) At times it is possible to machine a steel in the air-cooled condition, the governing factor being the alloy content. However, the highly alloyed analyses may require annealing or tempering after normalizing, to decrease the hardness.

It is essential, when normalizing is employed, that free circulation of still or agitated air be provided. When air-cooling of individual bars or forgings is not practicable, the furnace charge should provide for some means of separation, such as racks or spacers.

If you would care to know more about normalizing, or any other phase of heat-treating, you are invited to consult with Bethlehem metallurgists. They have had long experience in such matters, and they know how each treating method affects the various alloy steels. They are always glad to give you any help you need.

And when next in the market, please remember that Bethlehem makes the full range of AISI standard alloy steels, as well as special-analysis steels and all carbon grades. We can furnish what you need.

If you would like reprints of this series of advertisements from No. I through No. XX, please write to us, addressing your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa. The first 20 subjects in the series are now available in a handy 36-page booklet, and we shall be glad to send you a free copy.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

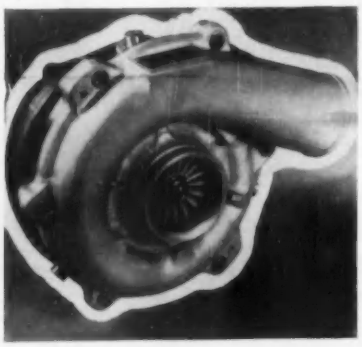
BETHLEHEM STEEL

NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Diesel Turbocharger

Increased horsepower and reduced fuel consumption are obtainable with a new turbocharger for Diesel engines in the 50 to 300-hp range, according to a recent announcement. Its impeller design is said to provide bet-



ter fuel economy over a wide range of operating speeds and loadings, and to permit considerably slower rotating speeds. Split-second response to changes in engine speeds and loads is also featured.

Maintenance of the unit has been simplified by eliminating split bearings and bulky housings. The design helps keep high exhaust gas temperatures away from the bearings and compressor sections. Connections for exhaust and air are flexible for ease of installation. *Thompson Products, Inc.*

Circle 60 on postcard for more data

Aluminum Solder

Two new high temperature soldering materials were recently announced, designated Alcoa Solder No. 805 and Alcoa Soldering Flux No. 66. Performance-tested in pilot applications, the high zinc solder (95 per cent zinc, 5 per cent aluminum) has been used successfully in joining heat exchanger return bends, electrical connections, automobile radiators, Alcoa solder sheet assemblies, transition joints, and fins to tubing. It will join all aluminum alloys, and make joints between aluminum and other metals such as copper, brass, steel, stainless steel and nickel.

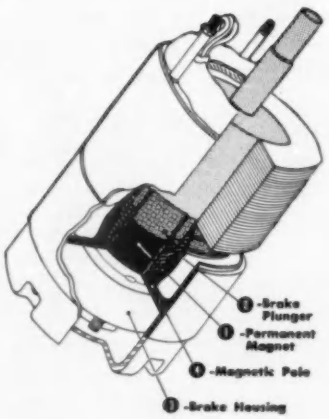
With a melting range of 715 to 725 F, the new solder can be heated by any conventional method. Strength of joints is directly dependent on lap length, with a length twice the thickness of the thinnest aluminum member suitable for most applications. *Aluminum Co. of America.*

Circle 61 on postcard for more data

Brake Motor

Comprising a polyphase motor with built-in mechanical brake, a new brake motor has been designed for precision stopping, quick release, and high braking torque. With the Cle-Matic "F" motor, solenoids and coils are eliminated. The magnetic field of the stator releases the brake when starting; and the permanent magnet applies the braking force when current is turned off. Braking torques are adjusted from the outside with a screwdriver.

Motors are available in 1800, 1200

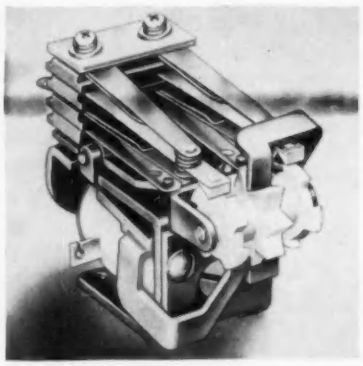


and 900 rpm, as well as in some slower and multi-speed designs. *The Cleveland Electric Motor Co.*

Circle 62 on postcard for more data

Sequence Relays

Low-cost midget sequence relays with a variety of DP-ST and DP-DT contact arrangements have been announced. Known as Frame 211, they incorporate a double cam movement which permits contacts to be adjusted to operate when the coil is de-ener-



gized. The cam rotates a half step when the coil is energized, and completes the step when de-energized. Ability to transfer contacts on either the "operate" or "release" phase is said to offer sequence arrangements never before practical in a simple low-cost unit. For example, "make before break" between two contacts could be more positive than usual by overlap during the time the relay is energized.

Frame 211 relays are equipped with DP-ST or DP-DT contacts which may be set to open, close, or transfer in any desired sequence, providing the number of steps in a cycle is divisible into six or eight (the number of teeth on available ratchets).

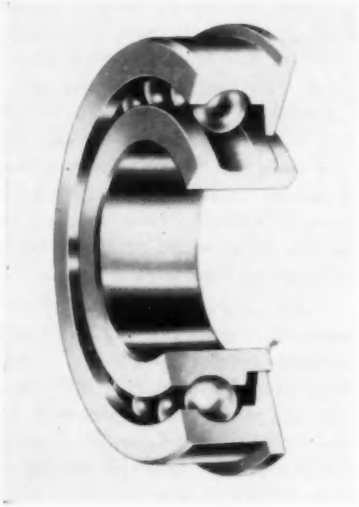
Coils in ratings up to 115-v dc, or 230-v ac, can be supplied. Power consumption is 5 to 6-w dc, or 10 to 12-va ac. Other coils are available on special order.

Heavy flexing contacts will carry 150 per cent of rated load. Ratings are 5-amp ac or 0.5-amp dc at 115-v, and 5-amp dc at 24-v. Ratchets and cams are of Nylon. *Struthers-Dunn, Inc.*

Circle 63 on postcard for more data

Ball Bearing

An unusual concept in ball bearing construction has been introduced in a unit which has unbroken inner and outer raceways and a full complement of balls, with neither insertion groove, retaining ring nor other assembly devices. The new Unibal ball bearing



has deep, burnished ball grooves. Radial and axial load capacities are said to be increased because of the raceway construction.

The bearings can be furnished in single row, double row, and flanged types; to close tolerances on bore and outside diameters; and with controlled radial and axial play. Where sealed bearings are required, integral labyrinth seals on one or both sides are obtainable. Extremely narrow widths and small diameters can also be supplied. *The Heim Co.*

Circle 64 on postcard for more data

Silicone Rubbers

Two new silicone rubbers have been developed for service at temperatures in the range of 600 F. Identified as Silastic 6535 and 2071, both are primarily cloth-coating stocks with excellent bond strength and low compression set.

Silastic 6535 is a liquid dispersion, shipped ready for solution-coating on glass cloth. When vulcanized it is said to be one of the most temperature-stable elastomers known. It retains its resilience from +600 F down to a brittle point of −178 F.

Silastic 2071 is designed especially for calendering, although it is also suitable for molding or extruding. Typical properties after 24 hours in a circulating air oven at 600 F include a Shore A-scale hardness of 63, a tensile strength of 770 psi, and 200 per cent elongation.

Both stocks are currently available in commercial quantities for such applications as hose and ductwork on jet engines, hot air systems on aircraft, and similar industrial uses. *Dow Corning Corp.*

Circle 65 on postcard for more data

Polyester Resin

Hetron 33 is the designation for a polyester resin recently introduced. It is a medium viscosity, semi-rigid type polyester possessing high strength qualities; and is recommended for use with glass fiber where good impact strength and flexural strength are required in combination. The new material is considered by its maker to be an excellent molding resin, especially for matched die molding.

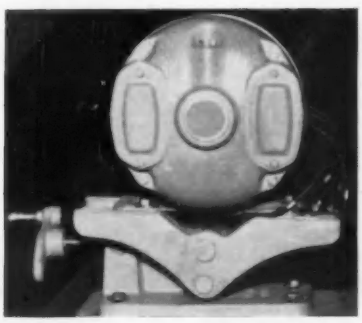
The product's physical properties compare favorably with Hetron 32A which has been accepted by fabricators for applications such as matched die molding of automotive parts. Its price per pound, delivered in truckloads, is about 13 per cent less than for 32A. *Durez Plastics Div., Hooker Electrochemical Co.*

Circle 66 on postcard for more data

Tilting Motor Base

For use with variable speed pulleys, a tilting motor base is now being produced which adjusts belt tension when speed changes are made while the machine is running. It also facilitates changing of belts.

One size, measuring 5½ by 7½ in., is for all fractional horsepower motors. Belt tension is set by means of

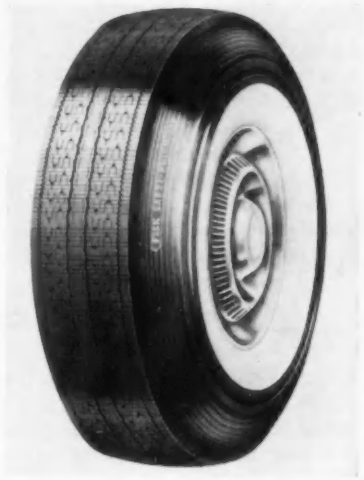


a handwheel screw adjustment which changes the angle of tilt. *Lovejoy Flexible Coupling Co.*

Circle 67 on postcard for more data

Balanced Tire

Built-in permanent balance is featured in the introduction of a new passenger car tire called the Safti-Flight. Balancing is by means of a thin, wide strip of dense rubber that runs completely around the inside of the tire. This balance strip or band



is vulcanized to the lining of the tire when the tire is cured. Manufactured only in tubeless construction, the tire is said to be made with Nylon cord twice as strong as that normally used, giving it an exclusive eight-ply rating.

The hole and fork pattern and five rows of the new tread design put 92 per cent of the footprint area in contact with the road. The white sidewall, only 1¾-in. wide, is protected by a double scuff guard. *Fisk Tire Div., United States Rubber Co.*

Circle 68 on postcard for more data

Metallic Gaskets

With the recent inclusion of metallic gaskets, Vellumoid has expanded its line of gaskets. The metallic gaskets supplement the company's nonmetallic gaskets. New metallic additions include Coppermoid, a cylinder head gasket made of a combination of copper and steel which provides the strength of steel, as called for particularly in single-ply, shim-type gaskets, with copper's corrosion-resistance and sealing qualities. Head gaskets are also available in steel, steel-cored abestos and copper. Manifold, exhaust flange and other metal gaskets are produced from steel-cored asbestos. *The Vellumoid Co.*

Circle 69 on postcard for more data

AUTOMATION NEWS REPORT

(*Continued from page* 68)

ple test stand for final run in. To determine the extent and location of unbalance during the final run-in adjustments at various throttle settings, the operator merely checks the dials on the instrument panels. One set of dials indicates unbalance at the flywheel, the other set at the fanbelt pulley at the front end of the crankshaft.

Both the flywheel and the fanbelt pulley have evenly spaced holes near their outer rims. Any unbalance is corrected simply by riveting a small weight in the hole opposite the "heavy" side of the flywheel or fanbelt pulley.

According to Thomas C. Van Degrift, head of GM Research Staff's Special Problems Dept., the PSUI is superior to other GMR balancers in that it is faster, has no rotating parts, is less expensive, and is portable. He says that it may be feasible to apply electronic balancing techniques to other specialized balancing problems of individual engine parts. (*See illustration below.*)

VANGUARD COMPUTING CENTER

The Vanguard Computing Center, which opened recently at Washington, D. C., will be the nerve center of the vast global tracking operation now being organized by the Naval Research Laboratory as part of the U. S. satellites program.

Heart of the new center is an IBM 704 electronic computer, which will calculate and predict the orbit of the satellite when it is launched sometime during the International Geophysical Year.

The first earth satellite will be 20 in. in diameter and will travel at a speed of more than 18,000 mph in an elliptical course at altitudes of from 200 to 1400 miles above the earth.

Operating at electronic speeds, the computer will receive data from each tracking station in turn, and produce predictions of the satellite's path. These predictions will help observers at the next stations in the satellite's path to continue the tracking.

Once the orbit has been established and reliable long-range predictions have been made, the IBM 704 computer will continue to process incoming data to improve on its long-range predictions. At the same time the data processing system will start to analyze the information stored in its memory file to produce a complete definition of the satellite's orbit.

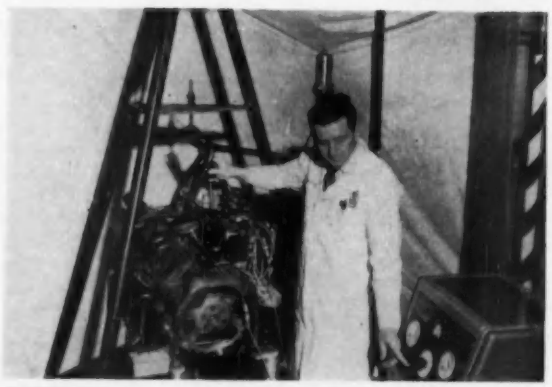
Tracking

If a casual observer does not know where and when to look, he will find it difficult to see the satellite due to its high speed, altitude, and apparent changes in path. U. S. Naval Research Laboratory scientists in the Vanguard program say that tracking this satellite will be as difficult as locating a golf ball travelling at the speed of sound at a 60,000-ft altitude. The brightness of the satellite will be only that of a 5th or 6th magnitude star—about the threshold of human perception. Aided by orbital predictions, however, a trained observer may be able to glimpse the artificial moon without optical devices.

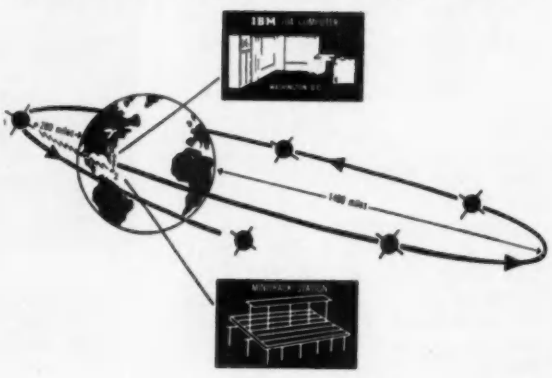
Radio tracking will be accomplished by means of the Minitrack system developed by the Naval Research Laboratory. Minitrack stations will be equipped with ultra-sensitive antennas to receive radio signals from the miniature transmitter in the satellite. Most of the stations in the western hemisphere will be located along a north-south line extending through eastern United States and western South America as far south as Santiago, Chile. Points will also be located in San Diego, Calif., Antigua Island, BWI, and Woomera, Australia, for complete coverage.

Each station will have a series of eight ground antennas. Each time the satellite passes a Mini-

GM's new electronic balancer takes an engine's "pulse" at any running speed so that unbalance can be corrected both at flywheel shown here or at fanbelt pulley wheel



Map shows man-made earth satellite at various positions in its orbit. Satellite in position at far left (1) is sending a radio signal to Minitrack receiving station (2). Signal is relayed to IBM 704 computer in Washington, D. C. (3). Computer processes message and predicts future orbit of satellite for other Minitrack stations throughout the world.



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Lead existing in alloy or carbon steels in the form of sub-microscopic particles acts as a natural lubricant. Its effect on your operating costs will be pleasantly surprising.

Faster speeds, faster feeds, better finish and longer tool life possible with these free machining steels are helping hundreds of manufacturers to increase production and to lower costs.

See what "lubricated" steels can do for you—specify leaded on your next Aristoloy order. Get the cost-cutting benefit of "built-in" productivity.

For further details,
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ARISTOLOY STEELS

COPPERWELD STEEL COMPANY • WARREN, OHIO
Steel Division

EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

track station, several sets of data will be gathered and relayed within 20 minutes to the Vanguard Control Center in Washington, D. C. From there this information will be relayed to the Vanguard Computing Center for the complicated job of prediction.

Vanguard program scientists expect that reliable long-range predictions of the orbit will be made before the batteries powering the radio in the satellites are exhausted (about three weeks). Once the radio goes dead, optical tracking stations around the world will take over the job of tracking the silent satellite, relying on the computer timetables for the data to enable them to train their instruments at the right place and on time.

ON OUR WASHINGTON WIRE

Overtime pay on defense contracts is to become scarcer. Pentagan orders a review of contracts allowing overtime work. Reductions are to be made where possible, and resulting savings will be targets for Government recapture.

Negotiated bids serve small military suppliers nearly as well as do advertised bids, latest Defense Dept. figures show. It has brought out data covering prime contracts with small business, July 1956, through last March, indicating little difference in the two types of awards.

The once broad fast tax amortization program in the future will be available only for direct defense industries expansion. Office of Defense Mobilization, in closing four more of the expansion goals for which write-offs were available, leaves only the goals for research and development laboratories for direct defense; production facilities for military and Atomic Energy Commission procurement; and liquid oxygen and liquid nitrogen for defense use.

Rundown of outlays by the states for highways in 1956 shows they amounted to $5.351 billion. Increase over the previous year's spending was 11.2 per cent, Bureau of the Census notes.

New money to run U. S. military forces in the next 12 months is certain now to total at least $34 billion, and perhaps more.

Air Force will step up as much as possible its practice of releasing idle machine tools for current production. Last year, this policy put 11,300 formerly idle units (which cost $102 million to acquire) into operating plants.

Civilians are to steer the work in a great many vital defense posts now occupied by military personnel. Opportunities for civilians to advance will be found in numerous support activities.

All off for this year is any likelihood of Government controls over installment credit. Federal Reserve Board has decided in a year-long study that swiftly climbing consumer credit has just held pace with rising income.

Now wanted by the Army is an aerial jeep. It would be a small flying vehicle, built to haul at least 1000 lb of weapons and equipment and remain airborne several hours. With a top speed of perhaps 50 mph, it would fly at low altitudes.

Government experts say hiring will rise in the months immediately ahead. While total U. S. employment is at a peacetime peak, it has been on a plateau for several months.

Internal Revenue Service is taking a close look at the "non-profit" claims (for tax purposes) of some business associations and their activities.

SHORTIES

More than 28 per cent of the nation's trucks are on farms.

•

Eleven per cent of trucks in use are prewar models.

•

Mexico, Venezuela, and Brazil are the largest export markets for U. S. trucks. One out of every five trucks produced was exported last year.

•

California led the states in truck registrations in 1956 with 940,000. Texas ranked second with 818,000.

•

The weekly energy output of petroleum in the U. S. has been estimated to exceed 40 hours' work of 22 billion people — 10 times the total population of the world.

•

An airport surveillance radar used in air traffic control has 707 tubes, 230 fuses and weighs in the vicinity of 15,500 lb. Its range is about 30 miles from the airport.

•

More than 60 million miles of rayon cord, enough for 140 round trips to the moon, will go into original equipment tires for America's car manufacturers this year.

•

One engine and nacelle on a modern transport weighs more than 16 times as much as the Wright Brothers' plane.

•

More than 500,000 rivets, bolts, and fasteners are required in the manufacture of a giant new bomber.

•

Since 1934, more than $4 billion of state highway use revenues have been diverted to non-highway purposes.

•

Buyers in today's market should increase to 193 million by 1965, when a $600 billion gross national output is expected.

USING

DU PONT ELASTOMERS

neoprene · Hypalon®

in design

Bearing gives smoother performance, longer life because of neoprene housing and shaft seal

Convertible tops coated with HYPALON resist sunlight, weathering, discoloration, cracking

Among the many reasons for coating convertible tops with HYPALON is the long wear it provides. This new Du Pont synthetic rubber stays flexible at low temperatures; will not crack after prolonged exposure to all kinds of weather. HYPALON is exceptionally resistant to sunlight. And it can be compounded in an unlimited range of light-stable colors. Convertible tops coated with HYPALON also tailor and trim better in installation.

HYPALON doesn't develop a sticky surface to trap dirt and dust. Fabric coated with HYPALON resists soiling and when it finally does need cleaning, it washes clean with soap and water.

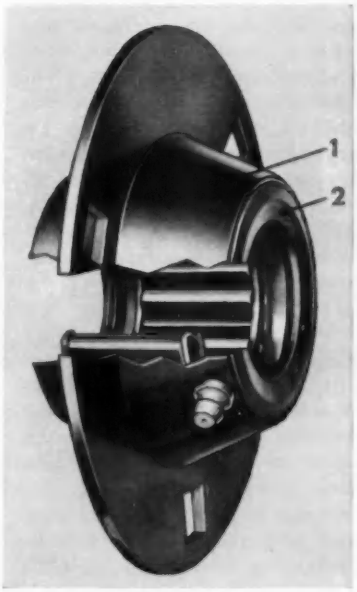
HYPALON is used in many other automotive items such as spark-plug boots, door stripping, whitewall tires. Its high resistance to ozone, heat, chemicals offer many more design opportunities. Mail coupon for full information.

Flexible neoprene housing on roller bearing adapts to instant changes in shaft alignment

This new cartridge type roller bearing, introduced by the Rollway Bearing Company of Syracuse, N. Y., is designed for use on farm and industrial materials handling equipment. It is made in shaft sizes from 1/2 to 1 7/16 inches. The bearing's flexible neoprene housing adjusts to shaft alignment changes caused by vehicle movement, or shifts in load distribution on the pulleys attached to the shaft. It permits misalignment between shaft and bolting flange of at least one degree. This adds considerably to bearing life and cuts fatigue on walls or panels to which the flange is mounted.

Rollway specified neoprene for the housing and shaft seal because it *keeps* its flexibility despite hard wear and extremes of temperature and humidity. Neoprene was also chosen for its outstanding resistance to oil and grease, and the abrasion of dirt and grit present in many installations. Regular bearing lubrication has no effect on the neoprene seal.

This is but one example of good design made possible with neoprene's *balanced combination* of useful properties. Du Pont's synthetic rubber is used throughout the automotive industry in applications where resistance to oil and grease, acids, abrasion, sunlight and weather are important. For more information, just clip and mail the coupon below.



1. Neoprene housing permits shaft alignment changes
2. Neoprene seal retains lubricant, seals out dirt

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METALS

Steel Operating Rate Down, But Inventories Are Low and There Is General Optimism Over Prospects for Fourth Quarter of Year

By William F. Boericke

Steel Prices Raised

Following the rise of $6 a ton in steel prices July 1, which was declared inadequate by some producers, steel users endeavored to pass along the higher steel costs to their customers, if competitive conditions permitted. Few were willing to absorb the increased costs. Actually the increase was somewhat smaller in relation to the wage boost than in 1956, when an increase of $8.50 per ton was posted to compensate for a 24-cent wage rise. This year the increase was $6 on an estimated 20-cent wage hike. Using the rule-of-thumb ratio of 40 to 1, increased costs to hourly wage increase, the latter would call for about $8.00 per ton rise for steel to compensate. Warehouses thus far have raised their prices generally about $8-9 per ton for mill products. Farm equipment prices have been hiked about 5 per cent. The revised finished steel composite price of THE IRON AGE works out to $119.34 per ton, compared with the previous $113.40, representing an increase of $5.94 per ton.

On balance it may appear that the new prices will slightly improve the average realization per ton of steel shipped. But thus far this year the steel industry has been turning out a less profitable product-mix, with major demand for heavy structurals and plates while the call for light steel, a more profitable product, has been easy to slow.

Operating Rate Down

As expected, the operating rate for the first week in July fell below 80 per cent of capacity, then recovered slightly. It is generally expected that July will be the poorest month of the year, with August not much better. In the first quarter of the year the mills operated at 96 per cent, then dropped to 87 per cent in the second quarter. Not much more than 80 per cent is anticipated for the third quarter and some feel the rate may go to 75 per cent. But these ratios hold only for the industry as a whole. Individual companies may fare better or worse than the average.

But there is general optimism quarter and even for the third over prospects for the fourth there is a feeling the drop may be less than estimated. For one thing, there was little preventive buying to anticipate the July price increase, hence inventories continue to be low. Hand-to-mouth buying has been the rule. The automobile industry is expected to increase its buying rate in the late summer months, construction demands are above expectations, farm buying is improved, and there has recently been a reversal in new housing after a long decline.

Structurals Getting In Balance with Demand

Heavy structurals and plates, mainstay of the 1957 steel demand, are being brought into balance. For the first half of the year production gained 24 per cent over the same period of 1956. Further gains are expected in the second half and in 1958. Demand is still strong for shipbuilding, freight cars, and oil country goods but delivery dates are improved.

Stainless and alloy steel producers see improvement ahead and banking heavily on better demand from Detroit. It is frankly admitted that the second quarter was disappointing for some companies. Inventories of ferrochrome are reported to be very low. Price adjustments are being considered but have not yet been announced.

Scrap prices have eased after rising steadily from their low of $39 a ton. By mid-July prices were $53, off about $1 to $4 per ton for No. 1 heavy melting scrap. No special significance was attached to the decline. It was felt that the mills did not reach for scrap at higher prices while the operating rate was low.

Copper and Brass Business Slow

Business in mid-July was slow. In part, producers affirm hopefully, this has reflected the coming vacation period at the Connecticut Valley fabricator plants. Inventories generally appear to be comfortable and in an uncertain price market a cautionary policy prevails.

There are exceptions. One of the smaller manufacturers of copper tubing asserts his second quarter sales were higher than the first quarter with incoming business indicating the same trend will continue in the months ahead. A producer of fire-refined copper declares his output has been contracted for well in advance.

The cutbacks in metal production by the producers here and abroad total over 8000 tons a month. Quite possibly permission will be granted by the Chilean Government to cut back output, at the two big American-owned mines, by 10 per cent. If this happened, it is likely that the other Rhodesian producer will follow suit as the Prain group of mines has already cut 10 per cent. This could be followed with similar action by the Belgian Congo. The

(*Turn to page* 113, *please*)

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2-in-1 CHROME PISTON RINGS... *the standard of comparison*

Steel Conveyor Belts

(*Continued from page* 63)

nate the possibility of machine operators missing the conveyor.

The second steel belt is used to convey pistons. It is 0.063 in. thick by 24 in. wide and actually is part of an automated production line comprising 43 machine tools located alongside the conveyor. Starting at the tail pulley, cast pistons are brought to the first machining operation; from here to the end of the line, all machining is automatic and pistons are mechanically transported from one operation to the next.

As the first machining operation is completed, the piston is conveyed vertically upward by means of a flight conveyor to a spiral chute which delivers the piston to the steel belt conveyor. The chute positions the piston so that it is deposited with the base on the belt. Previously, when a piston occasionally fell on its side, the edges would cut into the belt when the piston backlogged. The chute deposits the piston between set guide-bars which direct it into a discharge chute leading to the machine which performs the next operation. Upon completion of this operation the piston is brought back to the conveyor as before and carried to the next machine, and so on.

The steel belt is installed by extending it around end pulleys and supporting members, as in the case of other type belts, and the ends are overlapped and riveted together.

Belt ends are overlapped by means of a standard-type belt stretcher comprising two pair of transverse members (such as 2 x 4's) each of which sandwiches one end of the belt. The two clamps are drawn together by means of block and tackle equipment: once the belt-ends are overlapped, countersunk rivet-holes are punched with the aid of a guide bar and the rivets subsequently driven and the rivet heads filed smooth.

Should the belt become torn in service, it is repaired by cutting out a length of belt embodying the torn section (using heavy-duty sheet-metal shears) and making a new splice. This is accomplished by moving up the take-up pulley, overlapping the ends of the belt, and riveting the ends together as in installing a new belt. In installing the belt, ample take-up provision is made for this contingency, as is good practice with all types of belt.

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BOOKS . . .

MACHINE TOOLS, *by Herbert D. Hall and Horace E. Linsley, published by The Industrial Press, 93 Worth St., New York 13, N. Y. Price, $5.50.* This book attempts to explain the various types of machine tools, how they function, and where they are used in the production line. It discusses all of the important factors which make modern production possible, such as gaging and inspection operations; the manner in which essential parts are fitted together for proper functioning; organization for production; and time and motion study. All phases of metalworking operations are covered, including the use of transfer machines and other automation equipment.

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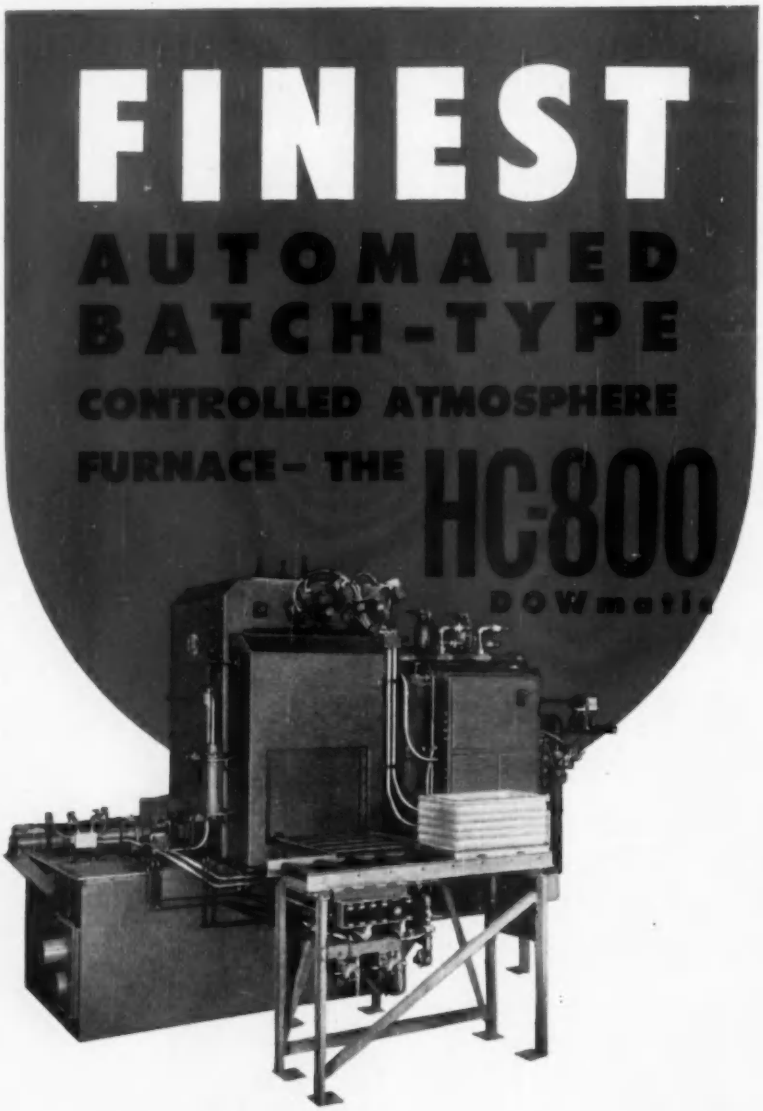

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Autocycling Process for Surface Treatment of Aluminum

(*Continued from page* 49)

lution is completely mixed at the first turns of the agitators.

There are about 10 ft of electric panels for the installation and in them, in addition to the normal electrical components, are the timers and cyclers unique to this system. Lights on the console indicate the process at work in the closed tank during the entire operation.

For the anodic operation one of the first germanium rectifiers in general industry is in operation. It has a rating of 3000 amp at 50 volts for ac to dc conversion. The anodizing operation is accomplished automatically through current and voltage regulators.

From the anodizing operations the fumes are drawn off and routed through a fume washer (actually a spray of water). This de-contaminates the fume-laden air which is then run through steam coils and through the cycling tank, keeping it up to temperature. Eventually the hot air is used to dry off the work in the final stage.

This use of waste material (the anodizing fume-laden air) eliminates one complete set of conventional fans for drying.

Waste waters are dumped into neutralizing pits before being released into industrial sewers. The Alodine solution, however, is returned to a hold tank or reservoir after each batch for reuse. The pH of this solution is continuously indicated by a meter mounted on the console. The Alodine solution is checked regularly by a process engineer for concentration and additional chemicals are added to bring it up to specifications when necessary.

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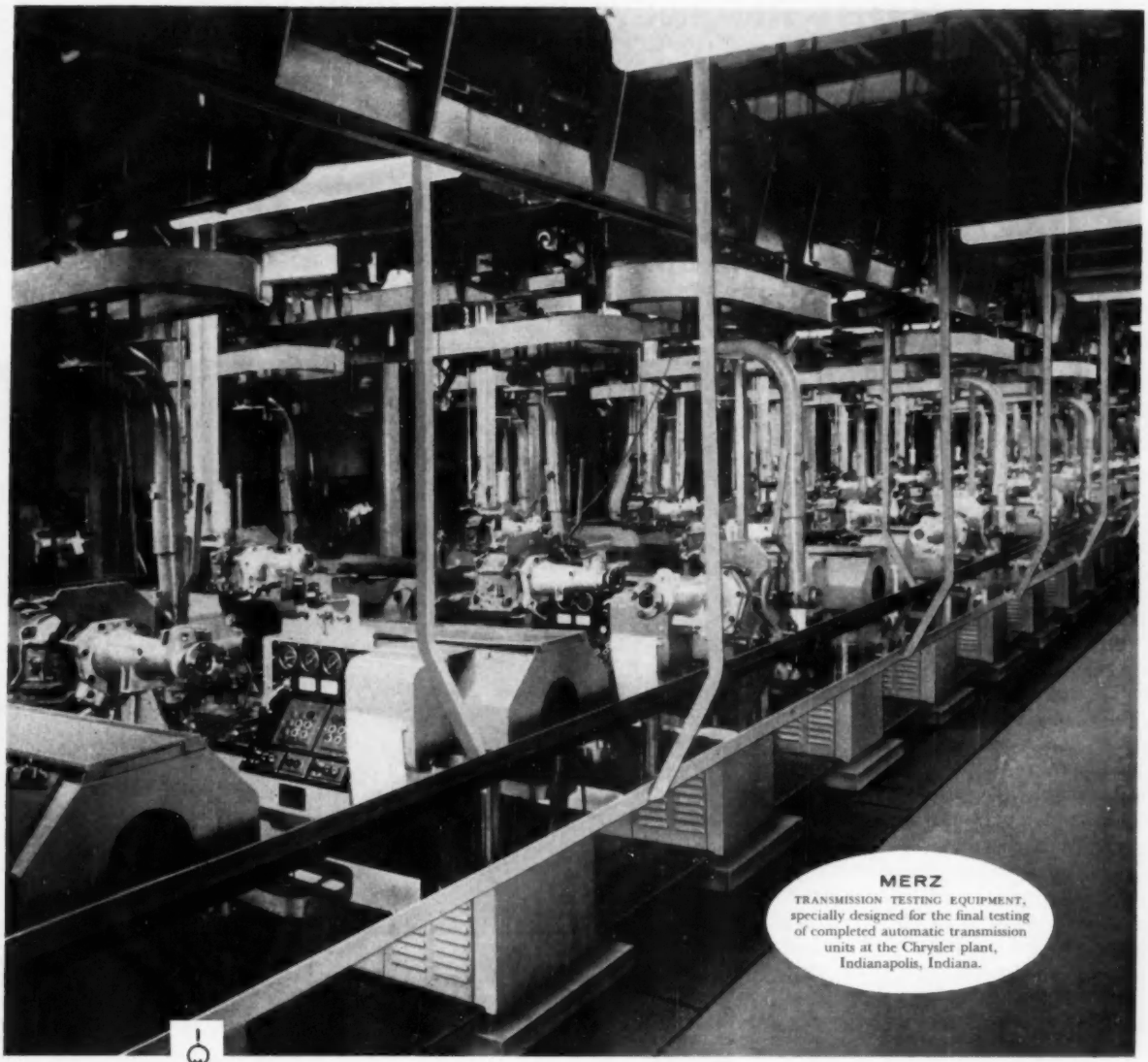

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Improving Automotive Products With Silicones

(*Continued from page 59*)

stant viscosity of a silicone fluid. This unit permits the fan to idle when full cooling is not required, effecting power savings up to 18 hp.

A damping device of growing importance is the regulator used in air suspension systems. Controlling the flow of air both in and out of the air cushions, these units utilize a silicone fluid to insure consistent performance in all kinds of weather.

Attaining success in truck engines and believed to hold high promise for automobile engines is the Novamatic valve tappet, a self-contained, self-adjusting device developed by the Valve Div. of Thompson Products Inc. Viscosity stability and resistance to shear are among the silicone characteristics on which this unit capitalizes.

On Diesel engines and some in-line engines for tractors, automobiles, and trucks, torsional vibration dampers employing silicone fluids have been successful. Such dampers will perform well regardless of temperature.

As yet, there is neither need for nor use of silicone fluids in vehicular hydraulic systems. However, their viscosity stability and ability to perform satisfactorily in the 500-700 F range make them leading candidates for use in aircraft and missiles of the future. In fact, the silicones are the only fluids known today to be viscous enough at 700 F to permit the operation of a hydraulic system. They are also usable at −100 F.

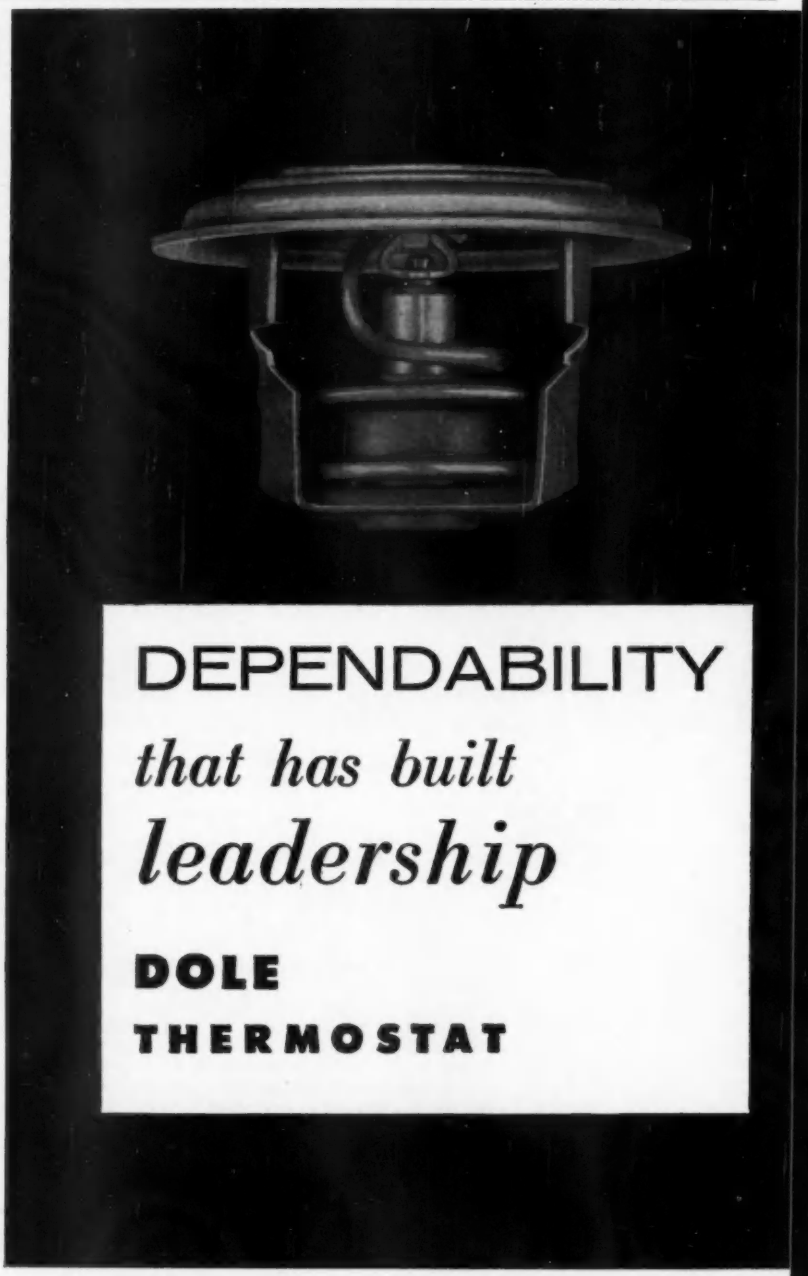
Silicones in Paint

Silicones may be used in automotive paints as basic paint vehicles, in copolymer blends with organics, or as additives performing specialized tasks. As a paint vehicle, the silicone offers outstanding performance in temperatures up to the 400-500 F range. These paints are also hard, glossy, and flexible. In addition, they resist oxidation, corrosion from road salts, and chemical attack.

One use of silicone-base paints has been on automobile engine manifolds, exhaust pipes and exhaust pipe connections. They will maintain their film integrity and good appearance on these components for tens of thousands of miles under all driving conditions.

Other uses include painting of engine blocks, motorcycle engine cylinders, and brake drums on cars equipped with wire spoke wheels. In each case, the silicone finish retains its attractive appearance despite exposure to heat and the elements.

As additives, silicones may function to improve the mar resistance of paints based on other vehicles or to prevent flotation of pigments. The latter is a particular problem



in metallic finishes so popular in recent years. Silicones, used in quantities of just a few parts per million of paint, can insure the desired dispersion of pigment and therefore a uniform, attractive paint film.

Other Additive Applications

Silicones are used in compounded motor oils and anti-freeze to prevent foaming. They are also used in the manufacture of foamable materials, such as the polyurethanes, which go into seats, dashboard crash panels, weather stripping and floor mat underlay. Their function is to control cell size, which in turn affects density, elasticity and compressibility.

Silicones as Manufacturing Aids

The same properties that make silicones useful in the operation or maintenance of automotive equipment of all types are also helpful in various phases of manufacturing. The largest and best established of these uses is in release applications; others include damping, sealing, lubrication and foam control.

The tire industry is the biggest customer for silicone release agents; and nearly every tire manufacturer uses silicones to cope with some or all phases of mold release problems. Excellent parting agents, the silicones eliminate mold build-up, objectionable odors and smoke. These other features have also led to their use in the production of floor mats.

One of the biggest car builders has used silicones for several years in the shell molding of crankshafts, valves, and camshafts as well as for other cast components.

Silicones are also used as release agents in die-casting operations with zinc and other alloys which produce parts for ornamentation and functional use. With silicones, parts come out cleaner and require less preparation for further finishing processes.

Another application for silicone fluids is in the Taylor Devices and Wales-Strippit liquid springs, which are widely used in setups for punching sheet metal and other brake-press work. Silicones are also used as anti-foams for cutting oils, lubricants for conveyor belts in high temperature baking ovens, protective compounds for many ordnance items, and as weld-backing compounds.

The Future

Having established many different footholds in the automotive industry thus far, the silicones are assured of a definite place in the future. None of these footholds has expanded to great size, but there are signs, as previously noted, that some major developments may be in sight.

In addition, there are a number of promising products using silicones in various stages of development in the laboratories and testing operations of the car builders and their suppliers. Possibly the most promising are the silicone fluid shock absorbers and liquid springs, of which there have been many versions.

One liquid spring, designed by

(*Turn to page* 111, *please*)

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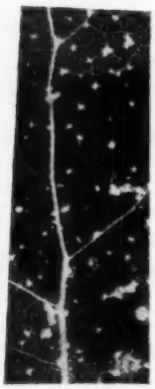

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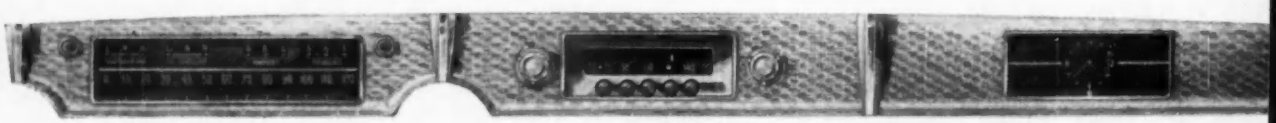

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ALCOA IS ALUMINUM

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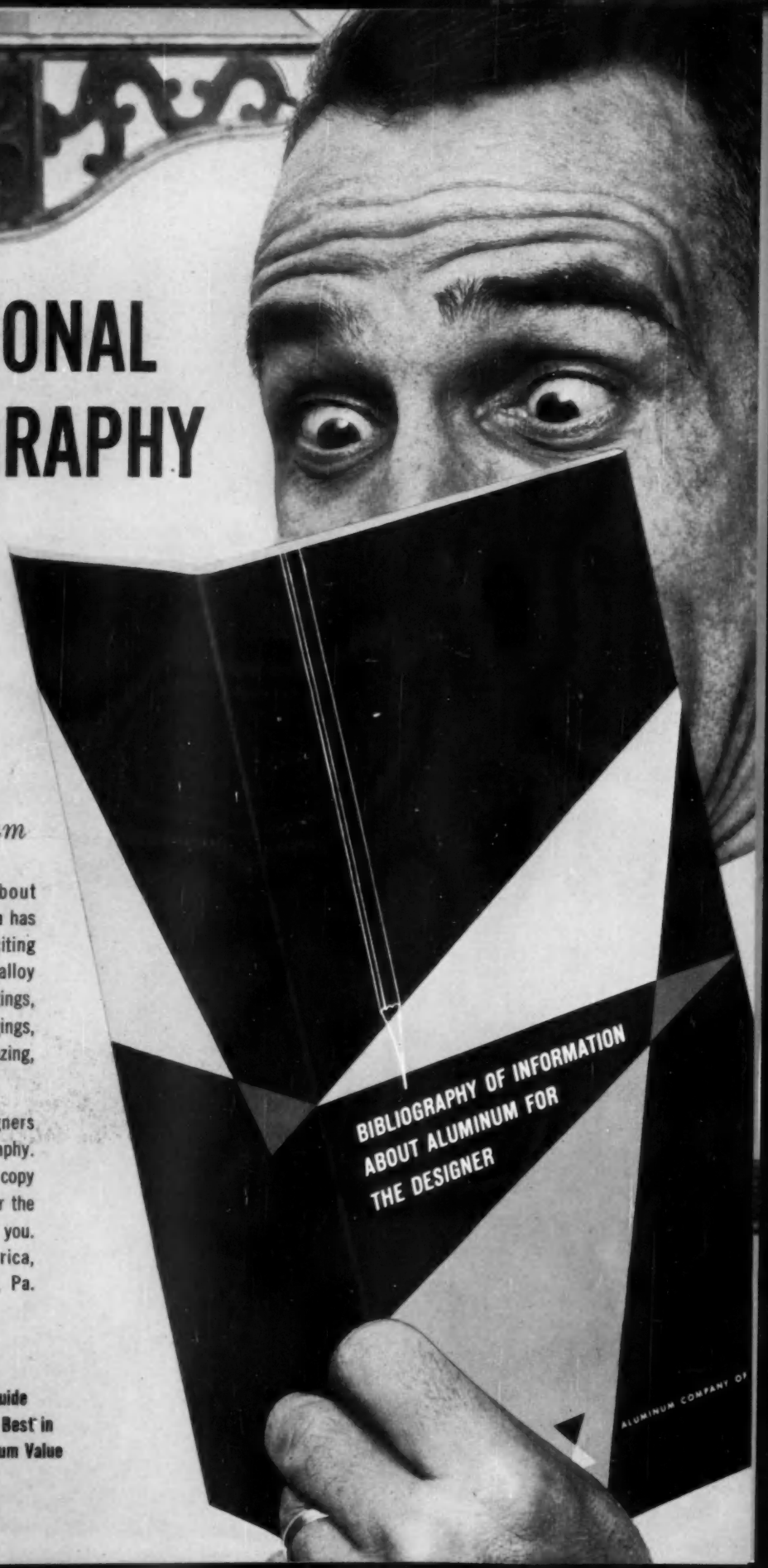

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Improving Automotive Products With Silicones

(*Continued from page* 105)

Tayco Developments Inc. and produced by Taylor Devices in Buffalo, has been on a major proving ground for two years. Based on the viscosity stability, shear resistance and compressibility of the methyl silicone fluids, it was designed to handle by itself the work now done by both the conventional spring and shock absorber. Similar devices are being studied in Europe for automobiles and trucks, and both here and abroad, for aircraft.

Cost is one barrier to future development, but the widespread acceptance already attained proves that price is not an insurmountable barrier, even in an industry noted for its cost-consciousness. And there are many instances, such as the self-contained tappet and various damping units, where the characteristics of the silicones permit cost-cutting design, operating economies, or improved performance.

In addition, the silicones will do things that other materials cannot do as well or at all. This will be important to the industry as the demand continues for better, more reliable preformance under more rigorous operating conditions.

The trend toward higher and higher compression engines has already created many opportunities for silicones. The use of turbines in any form will create many more, just as the turbines have done for silicone rubber, paint and lubricants in the aircraft industry.

Polish Motor Industry

(*Continued from page* 53)

of cargo. With a 39-ft diameter rotor, the Zuk BZ-4 cruises at 75 mph with a maximum of 95 mph, and has a ceiling of 6600 ft.

The engine is the seven-cylinder aircooled radial that also powers the Bies TS-8 trainer which was exhibited at Poznan. Of 820 cu in. displacement, the WN-3 has a take-off rating of 315 hp at 2350 rpm. It has a 5.31-in. bore, 5.27-in. stroke, and 6.2 to 1 compression ratio designed for running on 72 octane gasoline. The engine weighs 530 lb and has a frontal area of 10.3 sq ft.

A larger helicopter on show was the SM-1, powered by a 575-hp radial with compressed air starting. With a maximum load of 1080 lb it has a top speed of 110 mph and a 230-mile range. The 45-ft rotor has a de-icing installation and permits autorotation descents. It was reported that during the Fair one of these machines was sold to Austria for $50,000.

While Russia, Czechoslovakia and East Germany exhibited no new models at the Fair, Hungary made a surprise display of a military-type tracked vehicle offered for sale as a logging tractor. The GJ-800 with a net weight of seven tons has a load rating of two tons and eight persons, and a drawbar pull of eight tons. It is powered by a six-cylinder Diesel engine of 842 cu in. that develops 125 hp at 2200 rpm.

The transmission, with five forward speeds and one reverse, drives through a friction clutch and a pair of multi-plate steering clutches. Each 12½-in. wide track has five bogies with independent torsion bar suspension. Maximum road speed is 20 mph, and range is 200 miles with a fuel capacity of 80 gallons.

A brief visit to the Ursus factory near Warsaw gave a glimpse of tractor manufacture in Poland. Production in the country is concentrated on the Ursus C-45, an improved version of an early Lanz Bulldog, and current output is about 20 units a day (annual rate of 5500) with 6000 workers on two shifts. The plant is tooled with an international mixture of machines, inciuding many old ones that were removed by the

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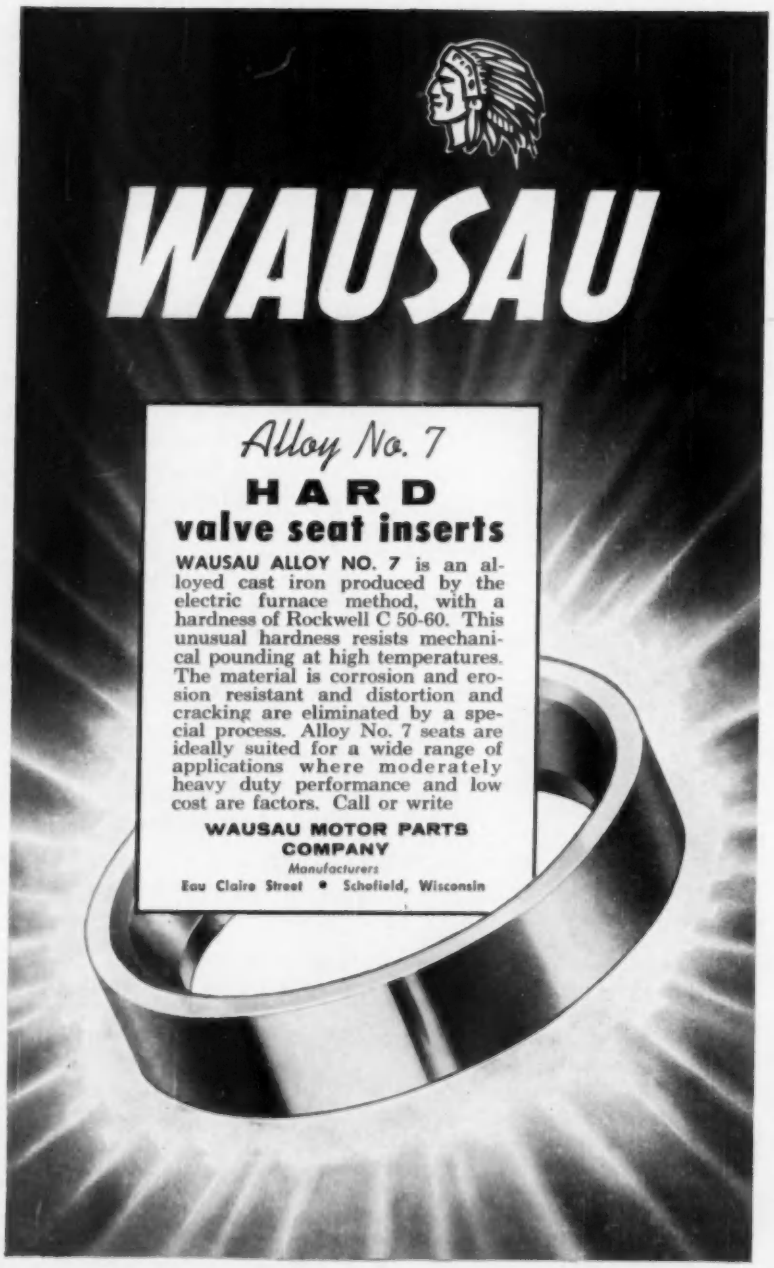
Germans at the end of the war, when they razed the plant before their retreat, and were later retrieved and repaired by the Poles. To these are added a sprinkling of up-to-date machines of Russian, Czech and East German as well as Polish origin.

Plans for modernization are under way, but are handicapped by several factors aside from the shortage of suitable equipment. Facilities are spread thinly, since a very high proportion of the components are made on the spot. They include all castings and forgings, as well as practically all of the parts, even to nuts and bolts. This is because the plant was one of the first to start up after the war, when Poland's engineering industry was incapable of supplying the necessary components and hardware.

In addition, the tractor itself, although of simple and rugged design, is of extremely heavy construction. For instance, the 66-lb piston does not lend itself to easy handling or machining (engine is a single-cylinder low-compression two-stroke of 8.8-in. bore and 10.2-in. stroke). Final assembly and painting utilize some advanced techniques, but even these tend to be cumbersome.

Polish engineers at the Ursus plant are well aware of these limitations, and production of a new model is planned to start next spring. In fact, output of the C-45 has been reduced from last year's level of 8000 in preparation for the changeover. Prototypes of three Diesel-engined tractors from 16 to 35 bhp are now under test, but there are also discussions with Massey-Harris-Ferguson, Lanz and Porsche concerning possible building of their models under license.

In contrast are two new wings of the factory which are devoted to making the four-cylinder 37-hp Diesel engine for the Mazur D-35 crawler tractor under Russian license. These are equipped entirely with modern Soviet machine tools, about 300 being in use. Many of them are single-purpose high-output units linked by roller track, with heavy castings loaded and unloaded by hydraulic hoists on overhead monorail.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TURBOGLIDE

(*Continued from page* 47)

For welding the joint is deeply chamfered on both the shaft and drum to allow for a heavy and deeply penetrating weld.

After welding, the drum end is finish-bored, faced, chamfered, turned, and grooved in a group of machines, including a special Hoern & Dilts machine and Ex-Cell-O precision-boring machines.

Finally, the part requires the milling of two series of slots. This is done in special Kent-Owens milling machines with a transfer indexing mechanism.

The T-1 turbine shaft, mentioned earlier, requires a variety of additional operations incident to its attachment to the turbine

element. This will be covered more fully in Part 3, to be published later. Part 3 will be concerned with some of the turbine operations, converter assembly and balancing, as well as the machining of numerous small parts, including gears and valve bodies.

Reverting to the transfer machine line for the case, it may be noted that the indexing of the work at various stations is effected by the configuration of the pallet conveyor. Thus the ends of the case are presented on both east-west legs of the conveyor; while the sides are presented on the north-south legs of the conveyor. In this manner Chevrolet dispenses with the usual indexing of a fixture or pallet.

METALS

(*Continued from page* 99)

result of such reductions would be to bring world production and supply into balance. Some observers believe that even without such action by Chile, there is today little surplus of production over consumption.

Price Confused And Uncertain

However, the price situation is confused. American producers maintain 29¼ cents a pound. One group of Rhodesian mines cut to 27½ cents for British customers, while the other continued to sell on London Metal Exchange prices, about a half cent lower. This action was followed by a cut by domestic custom smelter to 28½ cents, the lowest price since August, 1953. Scrap copper was offered at 22½ cents in mid-July. Allowing for refining costs this would be equivalent to about 26½ cents 90 days hence.

No action was taken by the two Rhodesian copper groups to get together and settle on a one-price basis for their British customers. If and when approved this would no doubt stabilize the European market and might bring Katanga into line as well. There has been keen disappointment because the London market, after firming up

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following prediction of a cutback in Chile, sank dismally below 27 cents before recovering slightly.

Chile's Position

Of course it is realized that the Chilean Government is in a difficult position. It desperately needs the revenues from its 50 per cent share in copper mining profits, hence it hesitates to authorize a cutback in output in spite of the present deplorably low metal prices. Under Chilean law it is stated that any production cut in Chile must not be larger in proportion than those made at mines owned by such companies in other countries. Hence Kennecott Copper would be forced to reduce output in its Utah pit in order to cut back at its Braden mine in Chile. Thus far Kennecott has not announced a cut similar to such action by other American producers, although it is thought it is accomplishing the same thing by deliberately mining a lower grade of ore.

If the expected one cent a pound increase occurs in the aluminum price, it would bring aluminum ingot up to 28 cents a pound, or about the same as copper on the open market. While aluminum would still be much cheaper than copper on a volume basis, its competitive position with the red metal no doubt would suffer to some degree.

Zinc Statistics Alarming

The June figures of the American Zinc Institute are the most discouraging for the year to date. Domestic shipments fell to 54,275 tons, lowest since the steel strike last year. The Government took little more than half of its purchases in April, May and June. With as yet only a minor decrease in daily rate of slab zinc output, stocks at the end of June climbed to 133,455 tons, the highest since 1954. Unfilled orders declined to less than 29,000 tons, lowest level reported for years.

Something like this unhappy showing had evidently been anticipated by some custom smelters, who cut their price to 10 cents July 1st. Not all followed however. It was freely declared that

the London price was high enough, after allowing for freight and tariff, to support the former 10½ cent price. The present 10 cent a pound price is the lowest for more than three years. Since early January the price has declined 25 per cent from 13½ cents.

Reasons for the price break are world-wide over production, sharply curtailed demand, principally from the brass fabricators and die casters, and reduced Government buying for the stockpile and in barter deals for foreign zinc in return for surplus agricultural products. There is no indication of immediate improvement in the situation.

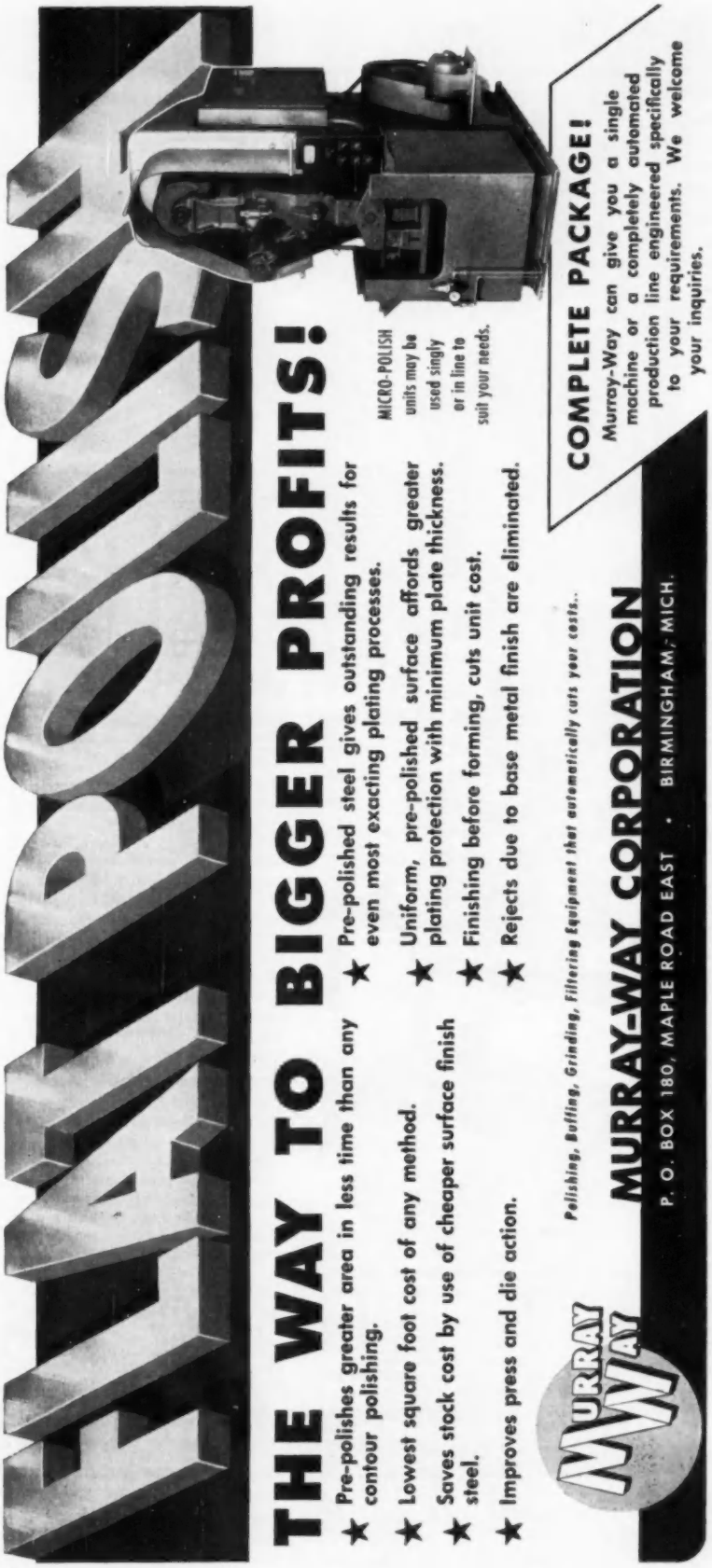
Production Being Cut

However, vigorous steps have been taken to bring production into line with slower demand. American Smelting cut back zinc production at the U. S. Mines by 3000 tons a month, about 6½ per cent of total U. S. mine output. The same company cuts its zinc production 30 per cent at its Texas smelter. This is equivalent to about 8 per cent of total monthly output of special highgrade zinc by all U. S. industry smelting plants. Another prominent smelter is reducing output by 1500 tons per month. In Australia the major producer, Mt. Isa, is discontinuing shipments of zinc concentrates to London and will stockpile instead. On top of these cutbacks are strikes at other mines and smelters which are being met by flat refusals to increase wages at this time because of depressed prices for the metal.

Higher import duties have been demanded by domestic zinc producers but it is not certain these will be granted. The Tariff Commission has indicated that higher duties would violate U. S. Trade commitments, and strong protests against the possibility have already been made officially by Canada, Mexico and Peru.

Aluminum Price Will Probably Rise

The chances now favor a boost in the aluminum price after August 1st when wages are raised under the three-year contract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signed in 1956. This happened a year ago when the first installment of wage increases was put into effect. The steel industry has started the procedure of raising prices when higher wage scales are instituted, regardless of market conditions, and quite likely the aluminum producers will follow suit. Wages will automatically rise 7 per cent. Assuming wages are 50 per cent of total costs, this means a 3½ per cent increase in costs. If prices were raised 1 cent a pound for pig, this would equalize the wage increase if other costs remained the same—which they won't. Fringe benefits and cost of living increases will double the 7 cent figure.

However, with demand rather definitely soft, producers may find it difficult to pass along the raise to their customers. Indicative of the easy market is the decision of some large primary producers to defer their ambitious expansion plans. Frank recognition of more difficult selling conditions was given by Anaconda Aluminum Co. in announcing it would cut back production 12½ per cent July 1 because of an accumulation of heavy inventories. Another indication is the unanimity with which big producers are "putting" metal to the Government under expansion agreements made during the Korean war. It is understood over 213,000 tons were offered to the Government which has been somewhat less than eager to take them up.

On the other side of the picture is the continued strike at Alcan's big Arvida plant in Quebec, which produces nearly half the aluminum ingots in Canada. The strike means a daily loss of 1000 tons of aluminum. To date the company has lost about 55,000 tons of metal. U. S. production of primary aluminum was 144,789 tons in May.

Announcing New SEIBERT

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View of typical 9-section unit equipped with pre-setting gages. All units built under licensee patent #2679038.

Now, from Seibert, you can obtain tool control boards that are individually designed to suit your production requirements. Panels are subdivided into sections for each type of tool, and divisions are arranged as required with space for two sets of tools for each job. Tool panels and benches are available in 3, 6, 9 or 12-foot lengths. In addition, you can now obtain from Seibert pre-setting gages of all types and also optional equipment such as plastic cyclometer covers with locks, drawers, shelves, etc., to suit your specific needs.

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Tool Control Boards are a tested and proven method of increasing the efficiency of production machine tools. They provide a system of scheduling tool changes according to pre-determined efficiency standards. You cut down-time, insure longer tool life, reduce tool breakage, and lower scrap losses.

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- Reduces down-time, provides an efficient system of programming tool changes.
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- Assures more efficient use of tools, reduces breakage and scrap losses.
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Quality MULTIPLE DRILL SPINDLES AND PRODUCTION TOOLS

Titanium Prices Reduced

The titanium situation has changed. It is still popularly called the wonder metal but at present producers of sponge and fabricators of sheet, strip, bars and wire are somewhat concerned over markets in the face of virtually doubled production in 1957, and some fear that the Government may taper off its orders.

This is reflected in the steady decline in the price of sponge and mill products. Grade A-1 sponge was cut in June about 20 per cent to $2.25 per pound. A year ago it was $3 a pound. This is the sixth reduction put in effect. It was quickly followed by a reduction in mill products varying from 85 cents to $1.50 per pound, from an average price of about $13.

Sponge production totalled 14,500 tons last year, and it is freely predicted it will reach 25-28,000 tons in 1957. Mill products came to 5000 tons in 1957 which brought $130 million in sales. It is evident that the titanium industry already is no weakling, but without Government buying, directly or indirectly, it could be badly hurt. It is expected that 11,500 tons of mill products will be available this year, but estimates of sales have been reduced to about 8000 tons.

MACHINERY NEWS

(*Continued from page* 79)

Solid Carbide Tool Institute Formed

A group of engineers representing the leading solid carbide tool manufacturers met in Detroit recently to form the Solid Carbide Tool Institute. One long-range objective of the Institute, of great value to users and manufacturers alike, is the establishment of uniform physical standards for solid carbide cutting tools. A similar objective is to standardize nomenclature and marking of this type of tool.

Officers of the Institute are: John A. Wright, Rotary Tool Industries, President; Clinton Smith, Pratt & Whitney Div., Vice President; and Richard Englander, Essex Rotary File and Tool Corp., Secretary-Treasurer.

Meetings will be held periodically to aid the standardization program which will include raw materials used to make the tools. Inquiries regarding membership or other matters may be directed to The Solid Carbide Tool Institute, 295 Madison Ave., New York 7, N. Y.

Around the Industry

The Cross Co. has announced the licensing of three firms to build the Cross machine control unit. Ralph E. Cross, executive vice president, stated that firms receiving licenses were Scully-Jones & Co. of Chicago; Seibert & Sons, Inc., of Chenoa, Ill.; and Royal Design & Manufacturing, Inc., of Detroit.

The Foote-Burt Co. has purchased all of the assets and business of the A. P. Schraner Co. This includes a two-story brick building, all of the machinery and inventories, and the right to the name "Schraner" together with patent rights covering the Schraner external cylindrical lapping machines and also the Schraner external roll burnishing machines. Total cost was approximately $285,000.

An 1889 model turret lathe, one of the very first manufactured by

(*Turn to page* 122, *please*)

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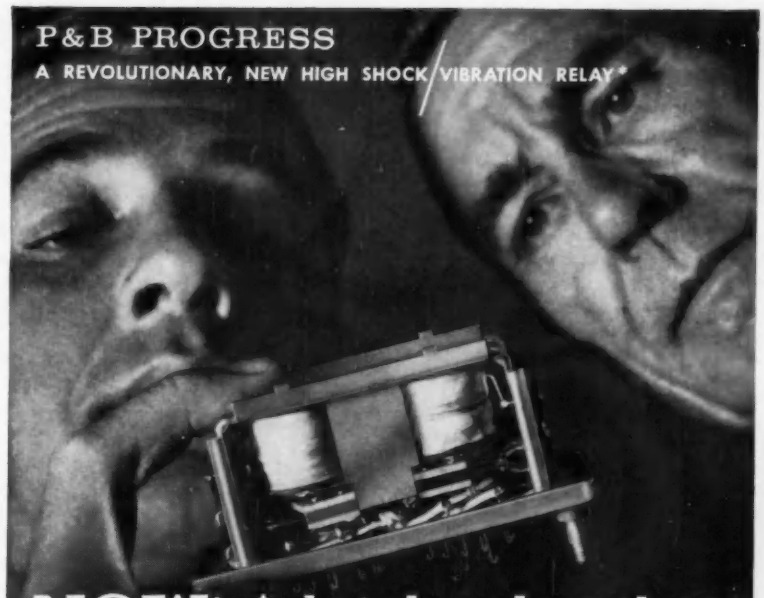
A REVOLUTIONARY, NEW HIGH SHOCK/VIBRATION RELAY*



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The secret of the KG's dramatically high resistance to shock and vibration is a permanent magnet which locks the armature into position.

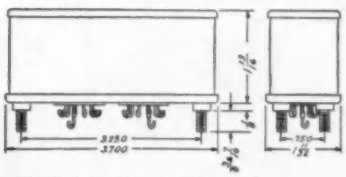
Tests show the contacts will open for no more than 80 microseconds during 100g shock.

Armature transfer from one set of the 6PDT contacts to another can be made in approximately 12 milliseconds with only 2.0 watts at nominal voltage.

Write or wire today for complete technical data.

*KG Relay Patent Pending

STAR SERIES KG RELAY ENGINEERING RESUMÉ



DESIGNATION: KG23DBH

GENERAL: Insulating Materials: Teflon, glass and ceramic.
Insulation Resistance: 100 megohms min.
Breakdown Voltage: 500 V. RMS.
Shock: 100g where contact openings less than 80 microseconds may be permitted.
Vibration: 30g 5 to 2000 cycles.
Ambient Temperature: —65°C to +125°C.
Weight: 13 ozs.
Pull-in-Speed: 12 MS using 310 ohm coil at 24 V. DC. (25°C).
Terminals: Two 11 pin multiple solder headers with hook ends for 3.20/AWG wires.
Enclosures: Hermetically sealed only.
Dimensions: 1-11/32 x 3.700 x .1-13/16 (See drawing for width, etc.)

CONTACTS: Arrangements: 6 pole double throw.
Load: Dry circuit to 3 amps, 115 V. AC, resistive. 5 amps, 28 V. DC, resistive.

COIL: Power: 2.0 watts at Nominal Voltage.
Duty: Either coil may be left energized without damage to the relay.
Insulation: Teflon tape.

MOUNTINGS: Four ⅛ inch #8-32 studs on 3¼ x ¾ inch centers.

P&B STANDARD RELAYS ARE AVAILABLE AT YOUR LOCAL ELECTRONIC, ELECTRICAL AND REFRIGERATION DISTRIBUTORS

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Plastic Solder for Automobile Sheet Metal Repairs

A NEW plastic solder, introduced in May of last year by the Chevrolet Division of General Motors Corp., as a filler material for metal surfaces, is already in use by close to 50 per cent of the company's dealers. The quick acceptance of the new method and material has been due to an intensive campaign conducted by the Service and Mechanical Department of Chevrolet and improved adhesive qualities of a new formula employing Epon resins, developed by the Shell Chemical Corp.

For the past six months, demonstration crews have toured the country showing dealers how the new solder can be used on the repair of fenders, bodies, tops, mufflers and fuel tanks.

The new type solder is sold to authorized dealers in kits which contain a supply of resin with curing agent or hardener — one quart of each. It can be spread at room temperature on the side of a body or fender without loss of material. It is said that little or no skill is required. In the thousands of applications that have been made by Chevrolet dealers throughout the country, no failures or "fall outs" have been reported.

Plastic solder is useful in the same way as lead or tin, for the repair of cracks, dents, gouges and abrasions. This is possible because the epoxy resin solder can be built up in a series of layers through successive curings. Also, because of its ability to cure at low temperatures, plastic solder does many jobs that would be dangerous with a torch. For example, in repairing small holes in a gas tank, the tank need only be drained — not steam-cleaned. Heat lamps and air-drying replace the torch. Plastic solder repairs can be carried out under and on the dash without damage to instruments. The material can be used also in filling holes close to the interior trim without danger of scorching fabric.

A brief description of the methods of applying plastic solder indicates its simplicity of application. After surface preparation, the desired quantity of resin is mixed with the hardener, using equal proportions. Chevrolet recommends scooping out the same size globs of each material on a piece of clean cardboard. Resin and curing agent have the consistency of soft butter and are mixed thoroughly. Each batch or mix has a useful life of about four hours, providing enough time for a number of repairs.

Next, the surface of the area to be repaired is preheated with a butane torch or a heat lamp. This step is necessary to remove moisture and grease to assure good bonding. The mixture is then applied. It is worked into the repair with a putty knife or paddle and

(*Turn to page* 122, *please*)

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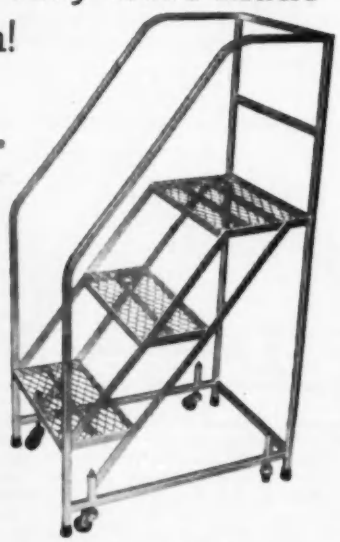
ALCO-LITE

All Steel Ladder-Stands that handle so easily you might think they were made of aluminum!

A gentle push will guide an Alco-Lite Steel Ladder-Stand anywhere you want it!



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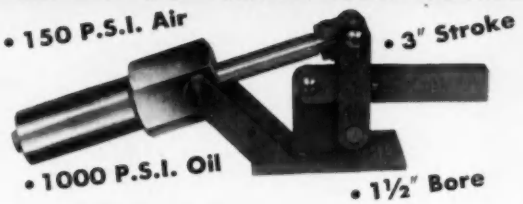
longer operating life



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Operates on standard air line, or your hydraulic line.

COMPACT, RUGGED CLAMP CONSTRUCTION
All-welded bar stock insures strength. All pivot points are bushed with Merriman Broach Fit hardened bushings.

UNIQUE ADAPTER JOINS CYLINDER TO CLAMP
Prevents any deflection in clamp from being transmitted to the cylinder rod—for longer operating life.

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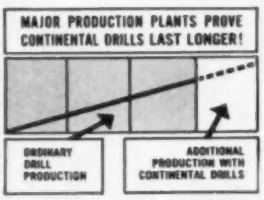
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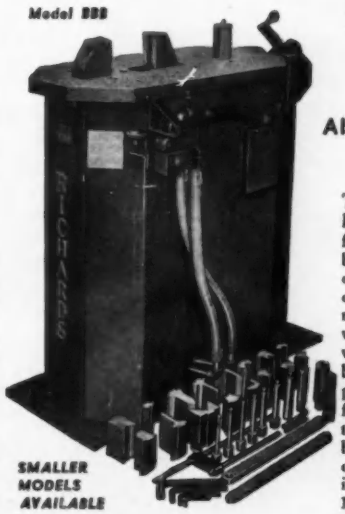
BIG BROTHER BENDER

Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender.

Model BBB



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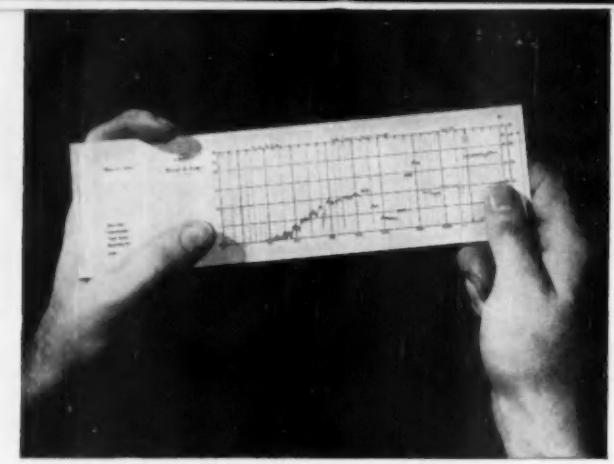


typical data presentation

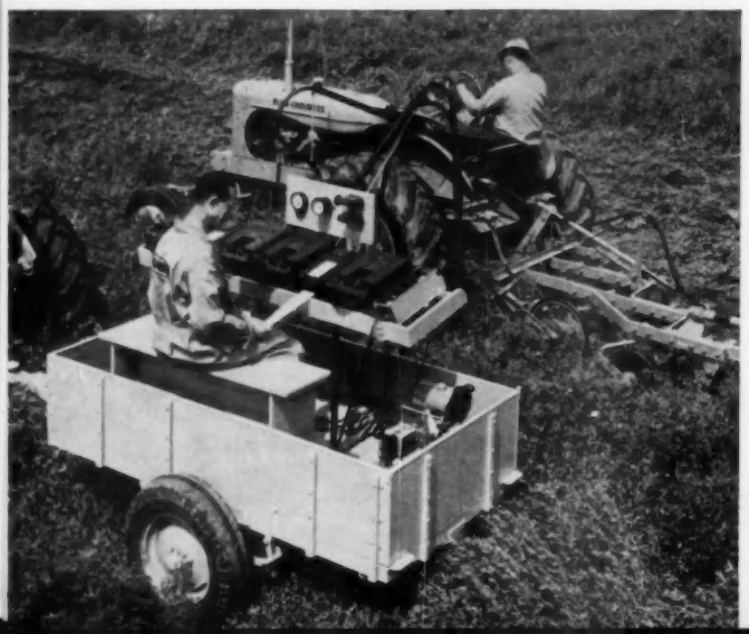
of Spectrum Recorder. Instrumentation consisted of Accelerometer, Vibration Pickup Preamplifier, and Spectrum Recorder.

CONVAIR CUTS JET LINER ENGINEERING TIME WITH AUTOMATIC SOUND INSTRUMENTATION

The noise problems of the jet age are receiving special attention in development of the Convair 880. Materials and components are being tested for acoustical properties in a new Sound Laboratory using Brush-Bruel & Kjaer instrumentation.

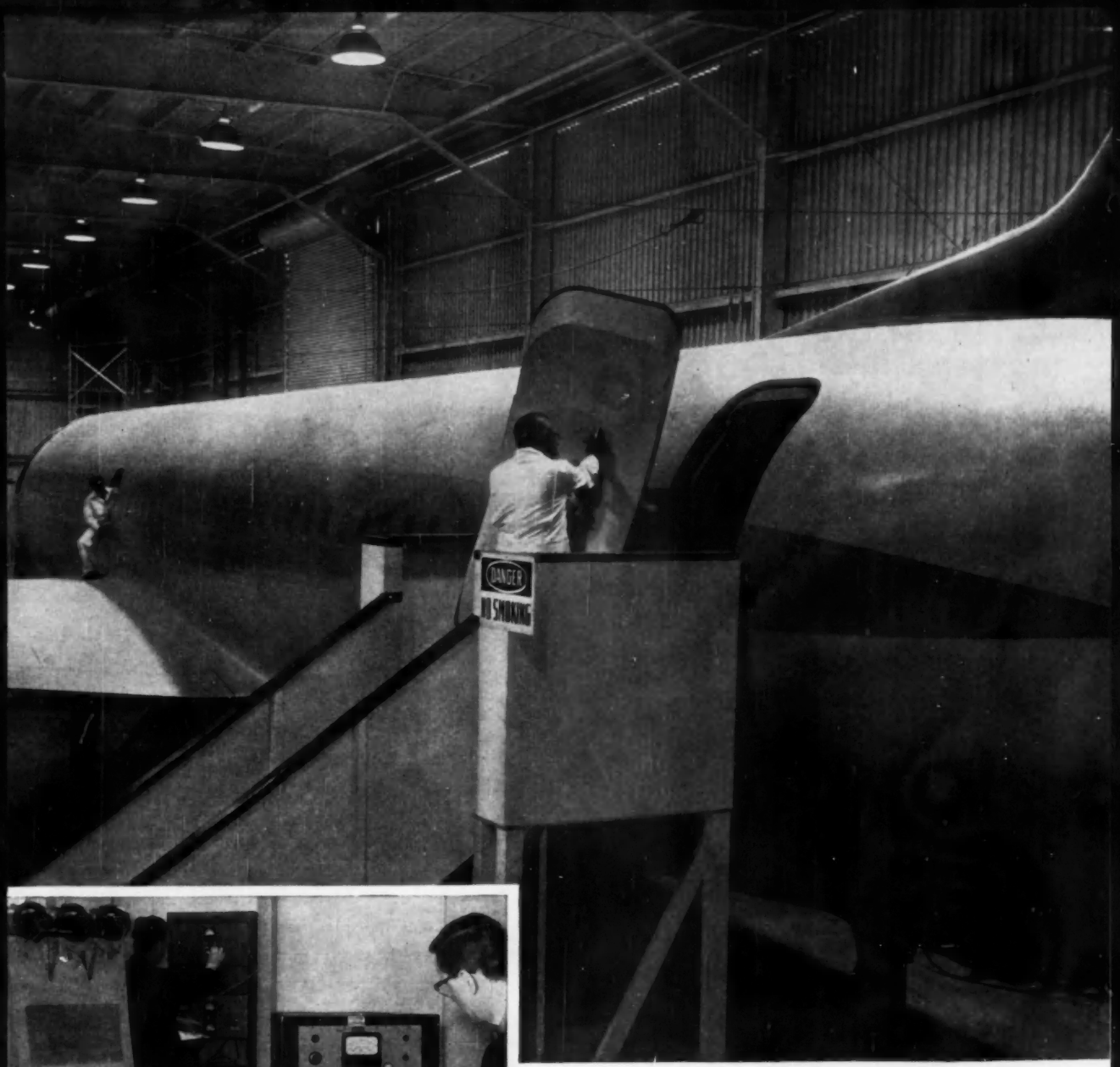
Here the unique Brush Spectrum Recorder performs a complete frequency-spectrum analysis on sounds from 14 to 36,000 cycles per second. Chart records, in one-third octave steps, provide data in most useful form to achieve desired results. **And this instrumentation, operating automatically, saves hours of engineering time.**

Brush-Bruel & Kjaer instruments are available in complete systems for analyzing sound-noise-vibration. Let us help *you* eliminate undesirable noise.



strain measurements speed up field tests

Here Allis Chalmers uses Brush Analyzers and Oscillographs to record variables such as weight and hydraulic pressure variation, drawbar load, axle torque, etc. ***Brush Oscillographs maintain accuracy in such rugged use, provide immediately available chart records to save engineering time.*** Described in booklet "Strain Recording".



Small section of fuselage skin being noise tested in Convair Sound Laboratory. Brush-Bruel & Kjaer instruments are used here to check transmission loss in panels, absorption coefficients of materials, reverberation times, and for general sound tests.

For information call your Brush representative.
Or write Dept. E-8 for booklet "Sound Measurements"

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QUARTER MILLION

"STEPS"

IN THE

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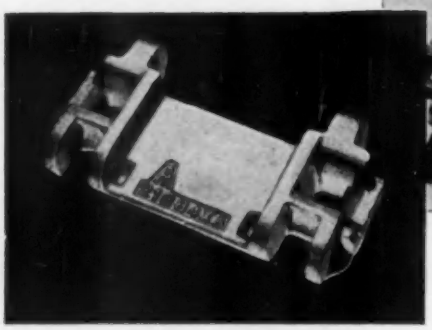
DIRECTION . .



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Continual operation in underground grit and dust subjects mining machinery treads to extreme abuse. Replacement is difficult and expensive, particularly on this section of the equipment, and parts must be made to last!

For over a decade, the abrasion-resistance quality of Unitcast's T-Loy 34 has answered this tread problem—as well as many other special parts for the same equipment.

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Unitcast

SPECIFICATION STEEL CASTINGS

(*Continued from page* 118)

smoothed over to roughly follow the contour of the surrounding metal. The patch is then cured. Fanning the plastic with a torch activates the hardener and the resin hardens so that the area becomes solid in about a minute. If heat lamps are used, the cure takes about 10 to 15 minutes with the infra-red lamps set up 12 to 18 in. off the surface. After this time the surface is sufficiently hardened to permit sanding. Smoothing the whole area is done in the usual manner. Priming can be done immediately.

MACHINERY NEWS

(*Continued from page* 117)

the Gisholt Machine Co., has been donated to the Smithsonian Institution. It will become a part of a permanent exhibit in the new Hall of Tools, at the United States National Museum Division of the Smithsonian.

A survey of machine tools and metal-forming equipment in use in Chicago plants indicates that about 58 per cent of such equipment is 10 to 20 years old, and another 20 per cent is older than 20 years, according to Commercial Discount Corp. The study was made in connection with the company's financing of new equipment purchases by metal-forming companies.

A new $6.5 million plant for the manufacture of grinding wheels will be built in Worcester, Mass., by Norton Co. for completion in mid-1959. This plant, to be known as Plant 8, has been designed for straight line production of wheels up to 30-in. diam.

An 8000-lb Ceco-Drop, the largest ever built, has been installed in the plant of English Steel Corp., Sheffield, England. The giant hammer weighs approximately 250,000 lb and stands nearly 20 ft above the floor line.

Manufacture of its 100,000th precision spindle was recently announced by Ex-Cell-O Corp. To mark this milestone in the production of spindle assemblies for accurate machining operations the unit was gold plated, and will be retained for permanent display.

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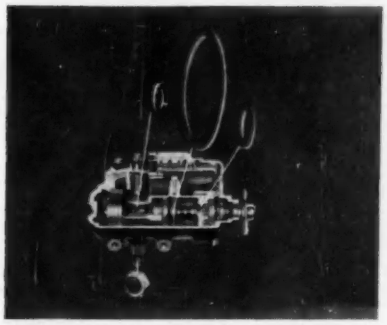
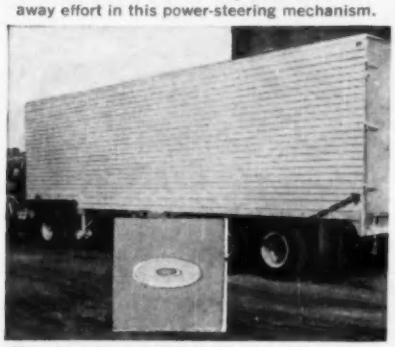
Better Things for Better Living . . . through Chemistry

AUTOMOTIVE ENGINEERING NEWS

LATEST PROPERTY AND APPLICATION DATA ON TEFLON® tetrafluoroethylene resins



Seals, piston ring and lock nut seal ring of TEFLON resins substantially reduced break-away effort in this power-steering mechanism.



Thrust washers used in trailer-door hinges are made of TEFLON resins. They stand up to rugged usage and require no lubrication.

Here's how lubrication, sealing and corrosion problems can be solved with DuPont TEFLON® tetrafluoroethylene resins

Components of Du Pont TEFLON tetrafluoroethylene resins provide a combination of advantages for automotive design that no other single material offers. Many problems of maintenance may be eased, or eliminated, with them.

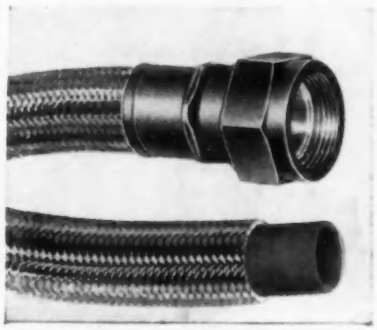
Lubrication is an example. Due to the "self-lubricating" properties of TEFLON resins, parts such as bearings, bushings and washers can frequently be buried within an assembly or sub-assembly without any need to provide oil ducts or grease fittings. Due to the toughness and mechanical strength of TEFLON resins, such parts are usually rated for the lifetime of the unit. In frictional contact with a metallic part, a molecular layer of the resin is deposited on it. Friction may be reduced to no more than that of ice against ice.

TEFLON 1, TEFLON 5 or TEFLON 7X are outstanding gasketing, sealing and packing materials. They are widely used in the chemical industry today for equipment handling extremely corrosive materials, and can withstand temperatures up to 500°F. TEFLON resins are completely unaffected by any type of automotive solvent or chemical or by the reaction products of internal combustion. No fuel or lubricant has any effect on — or is affected by — TEFLON resins. They will not deteriorate or swell under moist or wet conditions . . . will not undergo embrittlement even at arctic temperatures.

The truly remarkable characteristics of TEFLON resins may well be the means of helping you take a long step forward in design. An informative set of data and examples has been compiled, expanding on the design theme. It's free for the asking.

Typical properties of TEFLON® tetrafluoroethylene resins

Tensile strength, 73°F.	1,800 psi
170°F.	1,100 psi
Modulus of elasticity, 77°F.	58,000 psi
Shear strength	3,800 psi
Impact strength, —70°F.	2.0 ft.-lb./in.
73°F.	3.0 ft.-lb./in.
Stiffness, 73°F.	60,000 psi
Flexural strength, 73°F.	Did not break in standard test
Coefficient of friction	0.04
Coefficient of linear thermal expansion per °F.	5.5 x 10^{-5}
Thermal conductivity	1.7 B.T.U./hr./sq. ft./°F./in.
Water absorption	0.01%
Flammability	nonflammable
Specific gravity	2.1-2.2
Resistance to weathering	Excellent
Dielectric strength, short time (80 mils)	400-500 v/mil
Dielectric constant, 60-10^8 cycles	2.0
Chemical resistance	Inert to nearly all chemicals



Hose of TEFLON resins is impervious to fuels, oils, greases and hydraulic fluid. Moisture, sub-zero cold and tropical heat will not damage TEFLON resins.

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SEND FOR INFORMATION

For additional property and application data on Du Pont TEFLON tetrafluoroethylene resins, mail this coupon.

E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept.,
Room 48, Du Pont Building, Wilmington 98, Delaware

Please send me more information on Du Pont TEFLON tetrafluoroethylene resins. I am interested in evaluating this material for _____

*Name*_____

*Position*_____ *Company*_____

*Street*_____

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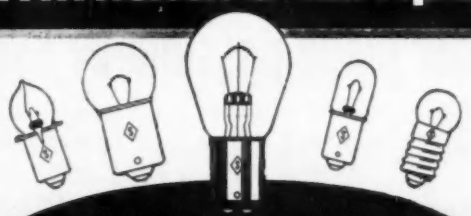

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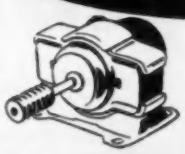

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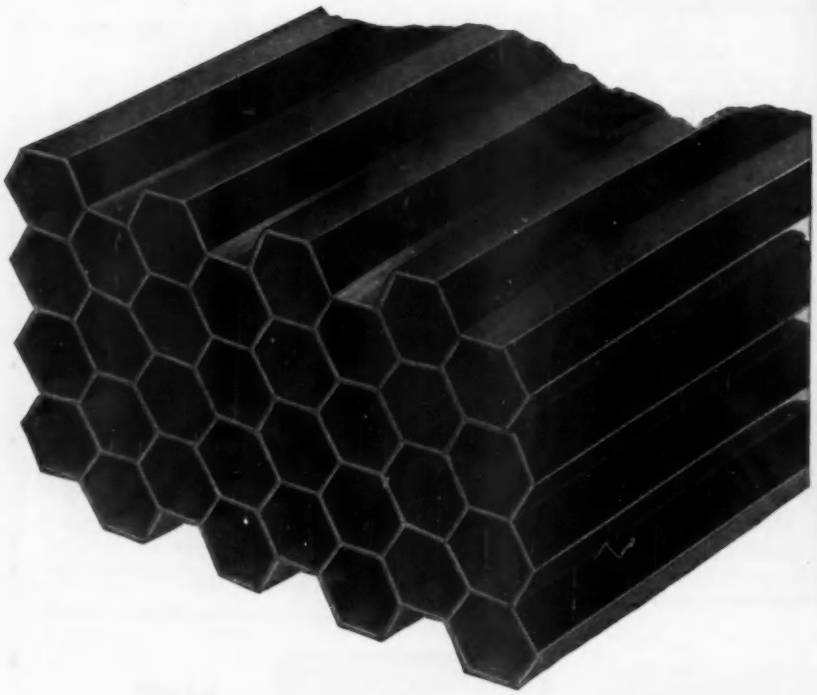
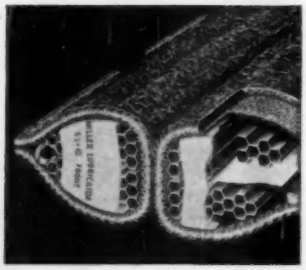
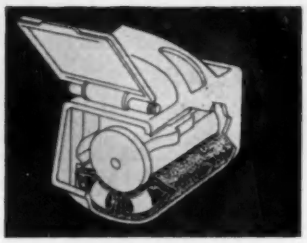




Lubricator for freight car journal boxes manufactured by Miller Lubricator Company, Winona, Minn. Hycar rubber is used in honeycomb spring core. Hycar latex is used as anchor for pad threads.



Cutaway drawing showing journal box application of lubricator pad that stops "hot boxes". Resilient Hycar core permits easy pad installation, assures uniform pad-journal contact and withstands oil immersion.

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Learn more about Hycar—it may help *you* design new products or improve the ones you already make.

For information on Hycar, write Dept. HJ-5, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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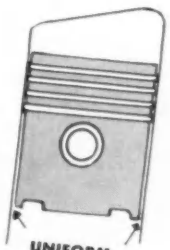

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